Performance Analysis of Penalty Area Entrances of a South African Men's Professional Football Team

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Declaration

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the owner of the copyright thereof (unless to the extent explicitly otherwise stated) and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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Abstract

The purpose of the study was to analyse the penalty area entrances of a team competing in the Premier Soccer League (PSL) in South Africa. Ten home matches of the team were analysed making use of a category set designed for the study. The main areas of analysis included the point of final action before the ball entered the penalty area, the part of the penalty area at which the entrance occurred, the method of entrance, the number of completed passes within the area, and the outcome of the entrance as well as the reason for the outcome.

The results revealed that the team entered the penalty area on average 59.4 times per match and scored a goal on every 37.4 penalty area entrances. The ball being taken away by the opponents was the outcome that occurred most frequently within the penalty area (42.1% of all entries), and was largely due to interceptions by the defending team (20.7%). The next most commonly occurring event was the ball being given away by the attacking team (22.4% of all entries) and was largely as a result of the poor passing (20%).

The results revealed that in order for the team to improve their ability to convert their attacking opportunities into goals, improvement of technical execution in particular passing and shooting within the critical areas of the field must be established. The results have implications for the use of performance analysis for professional teams as support for the coaching process.

Keywords: performance analysis; penalty area entries; goal scoring

Opsomming

Die doel van die studie was om ‘n prestasie-profiel te ontwikkel wat die strafarea-toegang beskryf van ‘n professionele span wat aan die Premier Sokker Liga (PSL) in Suid-Afrika deelneem. Tien tuiswedstryde van die span is geanaliseer, gebaseer op ‘n kategorie wat vir die studie ontwerp is. Die vlakke van analise was eerstens die punt van finale aksie voordat die bal die strafarea binnegaan, die plek in die strafarea waar toegang plaasgevind het, die metode van toegang, die hoeveelheid afgehandelde aangee-aksies in die area en laastens die uitkoms van die toegang asook die rede vir die uitkoms.

Die resultate het aangedui dat die span die strafarea ongeveer 59.4 keer per wedstryd betree en elke 37.4 ‘n doel aanteken deur toegang tot die strafarea te verkry. Die afneem van die bal deur ‘n span (42.1% van toegang) het die meeste plaasgevind nadat die bal die strafarea binne gegaan het. Dit is grotendeels te wyte aan onderskepping deur die verdedigende span (20.7%). Die weggee van die bal deur die aanvallende span (22.4% van toegang) was hoofsaaklik as gevolg van swak aangee-aksies (20%) en het ook dikwels voorgekom.

Die prestasie-profiel het aangedui dat indien die span hulle vermoë wil verbeter om aanvallende geleenthede te laat eindig in ‘n doel, verbetering nodig is met tegniese uitvoering, veral met vaardighede ten opsigte van ‘n bal-aangee en doelskop. Hierdie studie is ‘n voorbeeld van hoe prestasie-analise aangewend kan word in professionele sokker om ondersteuning aan die afrigtingsproses te bied.

Sleutelterme: performance analysis; penalty area entries; goal scoring; football

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Chapter One

Setting the Context

Football is not only a sport, but also a way of life for many people. There are many opinions frequently voiced by spectators about how the game should be played. Some of these observers may even believe that players' performances and the outcome of a match are only the result of the 90 minutes played on the field. However, this is not the case at the professional level. A match at this level takes place within a complex environment in which there are many factors that influence play during the match as well as its outcome. For example, different kinds of stress on players, coaches and referees are created when the political and economic pressures surrounding football are increased. There is a rising professionalism of the game at all levels and the implementation of a scientific approach to performance and player development also influences the ways in which the game is played. This chapter aims to give the reader a broad introduction to the context in which professional football takes place, and then identify the purpose and approach taken in this study, including a description of the significance of the study and its limitations.

According to the governing body of world football the Fédération Internationale de Football Association (FIFA), one of the major challenges of the modern game is dealing effectively with the large influx of money at all levels of play (FIFA, 2004). Financial considerations associated with television rights, sponsors' interests, and even the listing of some clubs on the stock market have all contributed to the establishment of football as a business. Cook (1996) explained that the business-orientation of modern professional football has elevated winning to a necessity. For professional teams, financial success is largely determined by their position on the league table and their ability to win competitions and trophies. In order for teams to win matches, they must score more goals than their opponents. When a team does score goals, it needs to be known why, so that the success can be repeated. When a team does not score goals, it also needs to be known why, so that new and more productive patterns of attack can be pursued.

Nature and Nurture

When a professional football team performs poorly, it often leads to a critical analysis of the youth programme in that country (Winkler, 2001). Questions are asked about the talent identification process as well as the development and training programmes. The quality of coaching, coaching education and support structures may also be scrutinized. Because lack of success is linked to problems with scoring goals as well as defending against goals, it is important to explore how the talent of the players on the team impacts on scoring (*i.e.* their 'nature') as well as how the coaching and training programme impacts on their scoring (*i.e.* their 'nurture').

Talent and Talent Development

It has been suggested that elite players possess some kind of natural talent or collection of abilities that allow them to achieve excellence within their sport (Williams & Hodges, 2005; Helsen, Hodges, Van Winckel & Starkes, 2000).Some scientists have argued that certain individuals may have certain characteristics that predispose them towards excellence and other individuals may lack those characteristics (Bouchard, Malina & Perusse, 1997).

Howe, Davidson and Sloboda (1998) proposed an operational definition of talent based on biological correlates of specific abilities in relation to expertise in music. They suggested five properties of talent:

1. It has its origins in genetically transmitted structures and is at least partly innate.
2. Its full effects may not be evident at an early age, but there may be some advance indications, which allow experts to identify the potential presence of talent before exceptional standards of mature performance have been demonstrated.
3. The early indications of talent provide a foundation for identifying those individuals who are likely to excel.
4. Only a minority of people are talented in a specific field.
5. Talents are relatively domain-specific.

Williams and Hodges (2005) cautioned that talent is a complex phenomenon and that while hereditary factors such as talent are likely to play a role in shaping an individuals' response to practice and training, skills are highly modifiable and adaptable to training. An individual may have inherent ability, but it is through practice that the individual becomes an expert.

According to Ward, Hodges, Williams and Starkes (2004) players who are offered full-time employment contracts by English Premier League Academies at the age of 16 are likely to have devoted more than 10 years to the sport, investing an average of around 15 hours per week, 700 hours per year, and a total of 7000 hours in specific practice activities. Ericsson, Krampe and Tesch-Romer (1993) described this type of training pattern as deliberate practice. He noted that deliberate practice is purposeful and focused on improving the individual's performance. The amount of time spent in deliberate practice activities will be related to the individual's ultimate level of performance.

It can be concluded that although talent may be an important consideration, a significant investment of practice time and effort is required to reach an elite level of performance. Deliberate practice is associated with becoming an expert, and it is a formal and structured approach to planning and implementing training sessions that requires expertise from another source in the sport development context, that of the coach.

The Focus of Training Programmes

Training programmes have the strongest impact on the development of a player's technique as well as a player's ability to make crucial decisions that can influence their ability to score goals. Winkler (2001) stated that a young footballer needs be trained holistically including cognitive, social, motor abilities (coordination, technical and physical) and psychological abilities (speed of decision making, will power, self control, concentration and self confidence). Winkler (2001) also recommended that coaches make use of training methods that instill an attacking attitude and an optimal risk-taking attitude in players. He explained that players must be helped to learn how to set up an attack, to create and capitilise on goal opportunities and to shoot goals effectively. In terms of defense, he specified that they must learn how to hinder the opponents from setting-up, to interrupt attacking opportunities and to stop shooting attempts.

There has been research that has found that both coaching methods and types of training activities have an influence on the development of skill and game intelligence (Launder, 2001). Griffin, Mitchell and Oslin (1997) recommended frequent use of modified small-sided games when developing tactical understanding and games sense. Modified games are designed to achieve technical and tactical outcomes according to the developmental levels of the players (Kirk, 2005). These 'designer games' can foster development of technique, as well as tactical understanding, which is the cognitive foundation for making decisions about what to do, how to do it and when to do it during a match (Wein, 2004). Specifically designed tactical games can enhance players' understanding of patterns of play that lead to scoring goals, and the skills needed to execute those patterns.

The Role of Performance Analysis

Pollard (1997) stated that it is difficult to think of any business activity in which decisions would be made without the collection and analysis of some sort of data and without a data-based performance monitoring system. Video-based performance analysis is a current approach in sport to the collection, analysis and interpretation of what happens during game play. As a technological support service, it has an important role to play in the identification of strengths and weaknesses in football teams and their opponents. In this way, it provides critical information in the preparation for matches.

In order to understand the role of performance analysis in coaching, it is helpful to see coaching as a cycle of processes. Carling, Williams and Reilly (2005) proposed a six-process cycle (see Figure 1). Within this cycle, the processes of observation, analysis and interpretation provide coaches with the data for decision-making and performance monitoring that they need to guide planning and preparation for performance enhancement (Borrie, 1996).

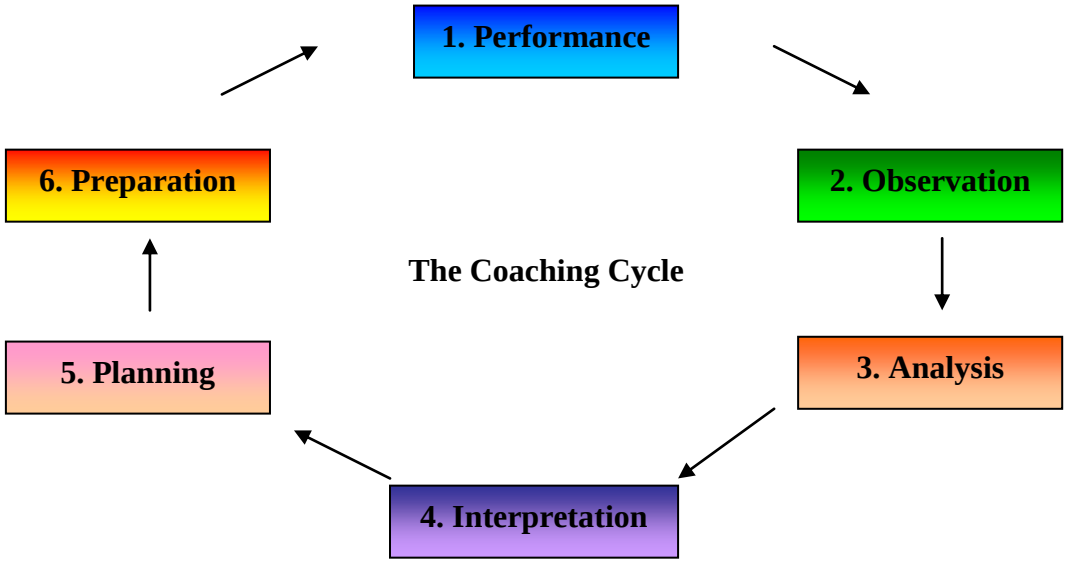


Figure 1. *The coaching cycle (Carling et al., 2005).*

Franks (2004) summarised the essence of the coaching process as the ability to stimulate observable changes in behavior and improvements in performance. His description of coaching was compatible with the six-process cycle:

1. The team performs in the match.
2. The coach observes the performance of the team and individual players.
3. The coach then analyses the team's performance in order to generate data about the performance. The sophistication of the analysis process depends on the technological support available to generate the data. Objective data about performance is critical for the analysis of performance.
4. The data must then be interpreted in the context of the team's priorities.
5. The planning of the next training session is undertaken by the coach based on the interpretation of data.
6. Preparation for the next match is implemented in the practice sessions.

During the season, the cycle continuously repeats itself. The interpretation of the information obtained from performance analysis is the source of information for the feedback given to the players and the preparation for the next match (Carling *et al.*, 2009). According to Hodges and Franks (2004) feedback provides both a motivational and an informational role, encouraging repeated performance and a reduction in the discrepancy between a desired and an actual outcome. In order to give constructive feedback, the method used to convey information and motivate the players is very important, not only in terms of what is said, but also how often, and how it is said. Feedback can be given by verbal personal recollections, quantitatively through statistical analysis or qualitatively through the use of video recordings or match reconstructions, and each has their relative effectiveness and degree of objectivity (Magill, 2003).

Although a six-process coaching cycle is a simple model on paper, Franks (2004) noted that its effectiveness is threatened if coaches rely too heavily on their subjective assessment of game action. The human memory has limitations, and it is almost impossible to accurately recall all the meaningful events that take place during a match. In studies by Franks and Miller (1986; 1991) it was found that coaches were less than 45% correct in their post-game assessment of what occurred during 45 minutes of a soccer match. This breakdown in gaining a full and accurate picture of what has happened in a match has a negative impact on the accuracy and objectivity of the feedback given to the players, which ultimately effects their learning and skill development.

Carling *et al.* (2005) identified some of the factors that can influence the ability of a coach to accurately recollect what happens in a match:

- The viewing environment – coaches tend to follow the ball and frequently miss off-ball information. Their viewing position is often poor in terms of seeing the action.

- Coaches' bias – The impact of expectations can be powerful on perception. Coaches may more easily see what they expect to see.

- Effects of emotion – Personal feelings of excitement, stress, anger, etc., can disrupt concentration and distort perception. A coach's impression of the match can be shaped by his/her emotional response to the match.

Findings such as these have been cited to support the use of objective and reliable means for recording and analysing game play through some form of performance (notational) analysis (James, 2006). Performance or notational analysis is not a new concept. There is evidence that hieroglyphics were employed by the ancient Egyptians to record features of movement, and the strategic deposition of military units has been used for centuries in warfare to make out plans of attack and defence (Carling *et al*., 2005). The ancients probably quickly realized the limitations of human memory, and explored more accurate and objective means of recording their information. Innovations in technology are providing today's coaches with fast, accurate, objective and relevant information allowing them to take apart each and every aspect of the game. These modern systems assist in facilitating the technical, tactical and physical analysis of performance and have enhanced the scientific approach to coaching (Carling *et al.*, 2009).

Performance analysis in football is expanding its scope beyond the analysis of match performance to the prediction of future performance (Taylor, Mellalieu & James 2005a). The idea of predicting is encompassed in performance profiling and has become an important aspect of performance analysis. The promise of performance profiling is that templates of technical and tactical play may be developed to guide the preparation and training of both elite players and teams, and as well as to identify the characteristics that should guide efforts to identify promising players for the future (Hughes & Probert, 2006). Realising the potential to predict performance will require a substantial investment in order to gather sufficient data for a data base from which to develop mathematical models.

Purpose

The purpose of the study was to develop a kind of 'descriptive performance profile' of a team competing at the professional level in Premier Soccer League (PSL) in South Africa. The profile focused specifically on the attacking playing patterns of the team in terms of how they enter the penalty area, and ultimately what happens within this critical goal scoring area, over 10 home matches. From this information attacking playing trends of the team were identified, and examples were provided of the feedback that could be given to the coaches to incorporate into their planning and preparation of the team for subsequent matches.

In order to conextualise the descriptive data, the attacking playing patterns identified in the study were compared to patterns of football teams documented in previous research completed for international competitions such as European Championships and World Cups, as well as European League competitions. This comparison was done in order to benchmark the South African team to international standards.

Research Questions

The study used computer-based digital video analysis of match performance. It was guided by the following research questions focused on the attacking playing patterns of the team over the course of 10 home matches:

1. From which area of the field is the final action of play before the ball enters the penalty area and which part of the penalty area does the ball enter from when attacking play is successful and unsuccessful?

2. How does the ball enter the penalty area when attacking play is successful and unsuccessful?

3. What are the outcomes and reasons for outcomes when attacking play is successful and unsuccessful?

Significance of Study

Limited performance analysis research has been performed on football in the South African context. Coaches looking for effective playing patterns may use data gathered from the matches of European teams and from major international tournaments. The problem with this is that the way football is played by these teams and in these kinds of tournaments may be quite different from how football is played in the South African context during the PSL season.

This research has the potential to help establish performance analysis as a valuable tool for use by coaches of professional football teams in South Africa. By tracking a team's entrance into the penalty area over a number of matches, it will be possible to identify trends and patterns that occur. Each team and individual has their own pattern of play, or particular habits, and it is possible that these habits could be limiting the teams and players

from taking their opportunities to score goals. By objectively analysing a number of football matches of a team, and studying their penalty area entrances, it would be possible to identify what happens to the ball once in the penalty area, and attempt to address why goals are not being scored.

The category set designed for this study addresses only the concluding aspects of attacking play which very few other studies have done. Data obtained from such a category set can assist in a better understanding of the relationship between the outcomes of attacking play and the reasons for these outcomes. It is hoped that the results of this study will demonstrate to coaches the potential usefulness of performance analysis, including:

- A method for objectively identifying effective methods of play.
- Noting strengths and weaknesses in individual and team play that can guide preparation for subsequent matches.
- Encouraging both coaches and players to look systematically for the reasons behind successful and unsuccessful outcomes (*e.g.* entries into the penalty area as in this study).
- Using the information gained from performance analysis to design training sessions to address the challenges that are identified.
- Develop an understanding among coaches and players of the link between technical and tactical actions on the pitch. Because the method of performance analysis used in this study was video-based, it allows players and coaches to see what they did on a video re-play. Raising the tactical and technical sophistication of coaches and players may raise the standard of play in South African soccer and allow South African teams to compete more successfully in local and international events in the future.

It may be a simplistic statement, but the jobs of the coaching staff, management and players in professional football are directly related to the team's ability to score goals. Although success is defined in terms of successful results, it is the effectiveness of the processes that produce those results that is the key to success. This study hopes to demonstrate that performance analysis can make an important contribution to the coaching

processes of observation, analysis, interpretation and planning, specifically in relation to developing talented players into successful teams who can score goals and win matches.

Methodology

The research study followed a descriptive case study design in which computer-based digital video performance analysis was implemented in order to observe, describe and interpret the attacking play and penalty area entrances of a South African football team competing in the PSL. The penalty area entrances (including final build-up) of the team over the course of 10 home matches were analysed using a category set designed by the investigator. The category set enabled the data gathered regarding attacking play to be structured and enabled more definite patterns of play to be identified. The category set focused only on the attacking play of the team, and in particular their final actions before entering the penalty area.

Limitations

The investigator identified the following limitations to the study that are to be kept in mind when interpreting the data:

1. The 10-match sample may not be a full reflection of the teams' patterns of successful and unsuccessful attacking play.

2. The performance analysis was completed for home matches only. It is known that playing away matches may not only have an influence on the results of matches, but also the ways that teams play.

3. This was a professional team with a large squad. This means that a variety of players participated in the 10 matches, which may have influenced the success or lack of success with some technical and tactical behaviours.

4. The analysis was driven by the category set, which limited the scope of the analysis only to those options provided by the category set.

Definition of Terms

Performance Analysis – It is the means of recording events in sports performance so that there is an accurate and objective record of what actually took place during performance (Carling *et al*., 2005). Analysists use performance analysis to evaluate the major facets of player or team performances such as physical, mental, tactical and technical skills (Carling *et al*., 2009), with the purpose being to improve the performance of the individuals or teams.

Penalty Area – The penalty area can be defined at each end of the field as being marked by two lines that are at right angles to the goal line, 16.5m from the inside of each goalpost. The lines extend into the field of play for a distance of 16.5m and are joined by a line drawn parallel with the goal line. The area bounded by these lines and the goal line is the penalty area (FIFA, 2009a).

Strategy - The elements of offensive and defensive play, and overall plan discussed in advance in order for a team to orient themselves and achieve a specific objective by means of applying specific tactics (Carling *et al*., 2005; Grehaigne & Godbout, 1995).

Tactics – The means by which strategies are implemented, and are the products of both team and individual behaviour (James, Mellalieu & Holley, 2002; Grehaigne & Godbout, 1995).

Attacking Play - The attacking phase of play is defined as the tactical situation in which the team in possession of the ball approaches the opponents goal with a clear intent to score, and is dependent on defensive play (Lucchesi, 2001).

Summary

This chapter recognises that many factors influence success in football, but that success is determined largely by the ability of a team to score more goals than their opponents in order to win matches. A goal is the aim of attacking play. The analysis of successful and unsuccessful attacking play provides critical information for both adjusting team strategies and preparing teams for subsequent matches.

In order to objectively analyse sport performance, it is important that some form of performance analysis be incorporated into a team's scientific approach to preparation for game play. This analysis can take place at varying degrees of complexity, from pencil and pen to computer-based real time digital video analysis. Regardless of the sophistication of the method, a category set is used or developed in order to ensure a structured approach to observation and data analysis. The data collected, analysed and interpreted can play a major role in informing the coaching process, and allow the coach to work on improving elements of play that were both positive and negative during matches, ultimately improving performance.

Performance analysis is undertaken in order to inform the coaching process. It is only by working with meaningful and accurate information that coaches can make informed decisions regarding the guidance and preparation of their teams. The next chapter provides a review of literature exploring performance analysis in the context of professional football.

Chapter Two

Review of Literature

The following chapter highlights past research defining the strategic and tactical aspects of sport performance relative to the patterns of play as revealed by various approaches to performance analysis of football. Special attention is given to research about how the attacking play in football is converted into goals. A closing section of the chapter is provided to acknowledge the ranges of variables affecting football performance that fall outside of tactical considerations.

Strategies and Tactics

The strategic and tactical aspects of a game consist of offensive and defensive moments of play (Grenhaigne, Marchal & Dupat, 2002). Offensive or attacking play is characterised by the circulation of the ball among teammates via short and long passes in the process of creating scoring opportunities (Goncalves, 1998). The attacking phase of play is defined as the tactical situation in which the team in possession of the ball approaches the opponent's goal with a clear intent to score (Lucchesi, 2001). Defensive play is any tactical moment in which a team is trying to regain possession of the ball (Grenhaigne & Godbout, 1998). Attacking play cannot be properly understood in isolation of the defensive phase of play, but rather as interdependent and closely connected with the characteristics of the attacking phase (Lucchesi, 2001). A team's ability to defend effectively and efficiently will be in relationship to the way in which the attack is developed.

Styles of Play

Pollard, Reep and Hartley (1988) stated that teams have their own unique strategies and tactics. At an operational level, little distinction is made between the terms strategy and tactics, but they do represent different constructs (Grehaigne, Godbout & Bouthier 1999). Grehaigne and Godbout (1995) defined strategy as the elements of offensive and defensive play discussed in advance in order for a team to orient itself, while tactics refer to the adaptations in playing patterns according to the situations encountered in the game, such as the actions of the opposition. Examples of tactics include adaptation to new

configurations of play and changes in the circulation of the ball according to the tactics of the opponents. Carling *et al.* (2005) defined strategy as the overall plan that is devised to achieve an aim or specific objective, and related strategy to the overall style of play adopted by a team. With this in mind, the strategic plan of a team is achieved by means of specific tactics, *e.g.* specific set-plays or the types of runs made by a player.

Carling *et al.* (2005) explained that a particular team's strategy or game plan is an expression of their technical abilities, playing style and how they collectively defend and attack. The strategy that is formulated will shape how the team practices and is trained to play, although it is not always successfully applied during game play. All 11 players on the field must fill their assigned tactical and technical roles in order to enable a team to function as a successful strategic unit (Hughes & Probert, 2006).

The definition of tactics focuses on the team as a group, but it is important to remember that tactics are the product of individual behaviours (James *et al.,* 2002). Individual players operate within their respective units and assume particular roles (Grehaigne, *et al.*, 1999). According to Taylor, Mellalieu and James (2004) a player's role is defined in relation to specific performance requirements for a specific position within a particular game context. From this perspective, learning tactical play has a strong cognitive element that needs to be taught, developed and trained over time. In order to train players it is important to have a clear idea of the technical and tactical requirements of the different positions.

Subjectively-derived Concepts

A number of studies dealing with the technical and tactical aspects of football have been based on subjective information gathered from expert coaches and observations of games, among other sources. For example Wiemeyer (2003) interviewed 14 coaches across varying levels of participation in order to establish positional technical demands of players (see Table 1). In only one case did all the coaches agree on the exact functions of a position, however many common features were apparent for the requirements of players.

Table 1.

Technical requirements of individual positions (Wiemeyer, 2003).

Position	Technical Position-specific Requirements
Goalkeeper	Positional play, reaction times, calmness
Sweeper	Control of ball, organizational skills, defensive play
Central Defender	Defensive play, heading capabilities
Wingers	Physical conditioning, 1 vs. 1 play
Defensive Midfielder	Defensive play, running, passing
Offensive Midfielder	Technical skills, passing, creativity, shooting
Striker	Speed, 1 vs. 1 play, shooting

Van Lingen (1997) also interviewed coaches in his earlier research, but his purpose had been to distinguish among the tactical requirements of players in different positions when their team had possession (on offense) and when their team did not have the ball (on defense). His results are presented in Table 2 and Table 3.

Table 2.

Individual tactical roles when team is in possession of the ball (Van Lingen, 1997).

Position	Tactical Position-specific Requirements
Goalkeeper	Positive distribution, communication
Sweeper	Circulate ball, switch play, play forward
Central Defender	Support build-up play
Wingers	Good cross delivery, score goals
Defensive Midfielder	Don’t run with the ball too much, switch play
Offensive Midfielder	Add support, get into scoring positions
Striker	Score goals, receive long balls

Table 3.

Individual tactical roles when team is not in possession of the ball (Van Lingen, 1997).

Position	Role Requirements
Goalkeeper	Prevent goals, organise defence, be aware
Sweeper	Give cover, close down space
Central Defender	Mark players, controlled defending
Wingers	Cut out crosses, tuck in to mark
Defensive Midfielder	Control play, mark a player
Offensive Midfielder	Support, defensive thinking
Striker	Keep opponents in front of you

Interview studies with coaches such as those conducted by Van Lingen (1997) and Wiemeyer (2003) are valid as reports of selected coaches' insights into the technical and tactical demands of the game. They provide a subjective record of coaches' opinions and beliefs regarding certain playing positions. It is important, however, that objective evidence is also collected to describe the context of the demands of different playing positions. Studies that examine the actual actions and frequencies of actions should be key contributors in identifying the technical and tactical demands of playing positions.

Objectively-derived Concepts

Dunn, Ford and Williams (2003) and Williams, Williams and Horn (2003) reported in their objective analysis of the technical requirements of different positions that the defensive unit performed the greatest number of clearances, the midfield unit the greatest number of dribbles, and the strikers the greatest number of shots. Taylor *et al.* (2004) confirmed these results using a larger study sample, and also found that there were technical differences among individual players within each playing position.

One of the most comprehensive objective studies performed to date on the technical analysis on football players was completed by Hughes and Probert (2006). They studied all the matches of the 2004 European Championship and calculated the technical requirements

of each playing position according to the percentage of on-the-ball actions related to each technical skill (see Table 4). They found that significant differences do occur between the outfield playing positions of football, and that coaches should consider placing certain players in specific playing positions according to their individual technical attributes. Therefore it is evident that different playing positions have different technical and tactical demands. It is important that current up to date objective research is performed on the technical and tactical demands of the game on players in different positions, as this can contribute to the better preparation of players.

Table 4.

Percentage on-the-ball action per position (Hughes & Probert, 2006).

Position	**Percentage of on-the-ball actions**		**Position**	**Percentage of on-the-ball actions**	
Goalkeeper	42%	Kick	Midfielder	54%	Pass
	21%	Save		9%	Receive ball
	16%	Throw		8%	Run with ball
	14%	Pass		6%	Tackle
	5%	Catch		6%	Dribbling
	2%	Punch		6%	Cross
				5%	Header
				3%	Free Kick
				2%	Shot at goal
				1%	Throw-in
Defender	53%	Pass	Striker	41%	Pass
	13%	Header		21%	Receive ball
	10%	Tackle		11%	Header
	7%	Throw-in		8%	Dribbling
	5%	Receive ball		7%	Run with ball
	5%	Dribbling		5%	Shot at goal
	3%	Cross		4%	Crossing
	2%	Free Kick		3%	Tackling
	1%	Run with ball			
	1%	Shot at goal			

Notational Analysis and Styles of Play

It is interesting to note the varied strategies and styles of play adopted by teams. Two notable strategies or styles of play that are often discussed and debated in terms of their effectiveness include the direct play strategy and possession football.

James (2006) identified Charles Reep as the pioneer of the use of notational analysis to inform coaching decisions, citing Reep's contributions over 50 years to the analysis of football and other sports in great detail. For example, Reep and Benjamin (1968) published data they had collected from 3213 English Professional League matches between 1953 and 1968, with specific reference to goal scoring and the length of passing sequences. Their main findings were that:

- 80% of all goals resulted from a sequence of passes of three or less.
- 50% of all goals came from possessions gained in the final attacking quarter of the pitch.
- A goal was scored on average every 10 shots.

Their findings led them to advocate adoption of the long ball game or direct play style of football, which has a tactical emphasis on getting the ball into the opponents half, in particular the penalty area, by using long passes from defensive and midfield areas (Hughes & Franks, 2005).

The Long Ball/Direct Play Strategy

The long ball game is based on the premise that the more times the ball enters goal scoring areas of the field, the more chance there is of scoring a goal (James, 2006). Bate's study (1988) supported the findings of Reep and Benjamin (1968), finding that:

- 94% of goals scored at all levels of international football were scored from movements involving four or fewer passes.
- 50-60% of all movements leading to shots on goal originated in the attacking third of the field.

Bate (1988) explored the aspects of chance in soccer and it's relation to tactics and strategy and favoured the more direct or long ball strategy in attacking play. He concluded that to increase the number of scoring opportunities a team should play the ball forward as often as possible, reduce square and back passes to a minimum, increase the number of long passes forward and forward runs with the ball, and play the ball into space as often as possible (Hughes & Franks, 2005). This viewpoint stresses the importance of the quantity of possession in critical areas of the pitch as opposed to the quality of ball possessions (James, 2006). The long ball play style is based on the premise that a team will score more often when they have more chances to score, although the quality of these chances may not be of high standard.

The Possession Football Strategy

Advocates of possession football emphasise the quality of possessions in critical areas of the pitch in contrast to the long ball game style of play with its premise that a greater quantity in chances to score will produce more goals (James, 2006). There is much debate in coaching and research communities in terms of the long ball/direct play strategy vs. possession football strategy. Hughes and Franks (2005) found that a number of teams have made use of direct play and have been relatively successful, but that consistently successful title winning teams do not usually make use of direct play. They concluded that additional levels of data analysis are needed if the relative advantages and disadvantages of different strategies are to be evaluated. In one of their earlier studies, for example, an analysis of patterns of play of successful teams (teams that reached the semi-finals) and unsuccessful teams (teams eliminated at the end of the first round) in the 1986 World Cup documented that successful teams played significantly more touches of the ball per possession than the unsuccessful teams (Hughes, Robertson & Nicholson, 1988). This would seem to support possession football.

Hughes and Franks (2005) noted that Reep and Benjamin's (1986) finding that 80% of goals resulted from a sequence of three or less passes might be misinterpreted because the authors did not normalise their frequency data. Hughes and Franks (2005) found data from the 1990 and 1994 World Cup did replicate the findings of Reep and Benjamin (1968) before it was normalised. However, after the data normalised (dividing the number of outcomes by the frequency of their occurrence) they found that:

- Successful teams had significantly more shots per possession from longer passing sequences than from shorter passing sequences.
- Successful teams had a better ratio of converting possessions into shots at goal.
- The conversion ratio of shots-to-goal was better for periods when a direct play strategy was adopted than when a possession play strategy was adopted.

James (2006) highlighted the complexity of committing to a single style of play. He commented that when it is difficult to get good quality passes to players in goal threatening positions, it makes sense to try more speculative passes into goal scoring areas in the hope that chance elements will play a role in presenting goal scoring opportunities. For example, Ensum, Pollard and Taylor (2005) found in the 2002 World Cup that South Korea created approximately the same number of shots as Brazil during the competition, but their inferior shots-to-goal ratio appeared to result from a failure to create good quality shooting opportunities rather than to poor shooting ability. The logic behind this interpretation was that if a team has many shots at goal but the shots are from undesirable areas of the field, a team that has fewer shots from more desirable areas will be more successful in converting shots to goals. Clearly, the development of a football strategy with implications for tactical play is not as simple as choosing between the long ball/direct play vs. possession play approach.

Variety of Styles of Play

It is interesting to note how teams evolve their playing styles over time and which patterns of play are successful. Hughes *et al.* (1988) determined that teams who reached the semi-finals of the 1986 World Cup tended to occupy the centre of the pitch more often, whereas those who failed to progress beyond the group stages utilised the wings more. Low, Taylor and Williams (2002) studied 40 matches at the 2002 World Cup and found similar results to Hughes et al. (1988). These results were not supported by Griffiths (1999) who found that in the 1998 World Cup, France were able to create significantly more shots-at-goal than their opponents while also retaining ball possession for longer periods of time, and creating more crosses. These results suggest that successful teams may utilise wide attacks more often than reported by earlier researchers (*e.g.* Hughes *et al.*, 1998).

Same Team, Different Styles

A study by Japheth and Hughes (2001) studied the playing patterns of France during the 1998 World Cup and 2000 European Championships, both of which were won by France. When comparing the two competitions, a number of differences were apparent:

- France performed on average 42 more passes, 10 more crosses, 6 more shots at goal, 56 more runs, 8 fewer dribbling sequences and had 30 fewer negative turnovers in every match during the World Cup compared to their performance in the European Championships.

- In the World Cup, France had a shot-to-goal ratio of 1:10.2 and in the European Championship, a ratio of 1:7.2 shots to goals.

- It was concluded that at the World Cup, France played better possession football and used the wings to attack by crossing the ball into the penalty area, whereas during the European Championships they tended to favour attacking down the middle of the field by combining passing, running and dribbling.

- They lost a higher percentage of the ball inside the attacking area during the World Cup, while during the European Championships the ball was lost more often in the defending area, which could be due to the fact that they ran with the ball much more in the defending area.

It is interesting to note the change of strategies and tactics adopted by France (with many of the same players in both competitions) in the four year period, and their success in both competitions. This highlights the fact that it is important for teams to be able to adapt to different playing styles.

Different Countries, Different Styles

Teams and performers often demonstrate a stereotypical way of playing, which includes both positive and negative aspects of performance. Within football research, limited research has been completed comparing the playing patterns of international teams (Brown & Hughes, 2004). In a 1988 study, Pollard *et al*. (1988) compared the playing styles of international teams such as France, Brazil and West Germany with teams from England (Sheffield Wednesday and Wolverhampton Wanderers). They found that:

- The English teams performed a greater number of long forward passes than either France or Brazil, and that Brazil and West Germany performed more passing sequences of three or more passes in defensive areas.

- The teams with elaborate styles of play (France and Brazil) depended heavily upon multiple sequences of possession whereas the English teams demonstrated direct styles of play consisting of long forward sequences of three or fewer passes.

Yamanaka, Hughes and Lott (1993) studied the playing patterns of teams from the British Isles, Europe, South America and Africa in the 1990 World Cup. They found that:

- The teams from the British Isles passed significantly less in the midfield and attacking areas and showed dominance in the air, implying that they depended heavily on a long ball strategy.

- The European teams performed a significantly greater number of passes, runs and dribbles within the midfield and attacking areas, reducing the chance of losing possession, which gave an indication of their possession football style.

- The South American and African teams were found to be very similar in frequency and distribution of their actions, which implied their commitment to a patient, passing strategy.

Bangsbo and Peitersen (2000) identified five differing international stereotypes associated with different playing styles: Latin, British, South American, African and Norwegian. National stereotypes such as Brazilian samba-football, Dutch total football, English energy football and German machine football and Norwegian computer football are labels constructed primarily in the media and by spectators and coaches. Most of the studies that have examined the playing styles of different teams have been subjective, using a small number of generally defined variables in their analyses, often using the terms for a team's specific attacking style interchangeably with its holistic playing style (Tenga & Larsen, 2002). Tenga and Larsen (2002) attempted to examine international stereotypical playing styles more comprehensively in their design a comprehensive category set or set of variables that addressed not only attacking, but also defending variables. In their study a total of 41 variables were categorised during a single match

between Brazil and Norway. Their study highlighted the following in terms of the attacking play:

- More use of the long pass by Norway.
- More use of fast strategy in building up attacks by Norway.
- More use of slow or elaborate strategy in building up by Brazil.
- More use of elaborate attacks by Brazil.
- More use of one touch per involvement by Norway.
- More use of four or more touches per ball involvement by Brazil.
- More use of five or more passes per attack by Brazil.

In terms of the defensive findings, similarities were found between the two teams in terms of counter attacks and set plays won in the first half of the middle third of the field and in the attacking third. These findings, especially those for attacking play, were in agreement with the previous findings about international playing styles by Bangsbo and Peitersen (2000).

Brown and Hughes (2004) discovered a number of relationships in their analysis of the 2002 World Cup in terms of the playing patterns in the offensive areas of European, South American, African and Asian teams.

- European teams performed significantly more dribbling sequences than South American and Asian Teams, and African teams performed dribbling sequences more frequently than South American teams.
- Asian teams used significantly more passes in the defensive third of the field than European, South American and African teams.
- European and African teams performed significantly more dribbling sequences in the midfield third than South American teams. The Asian and South American teams dribbled less frequently than European teams in the central

areas, and South American teams performed fewer dribbling sequences in the central areas than the African teams.

- South American teams took significantly more shots within the penalty area than Asian teams.

According to Brown and Hughes (2004), the results from their study highlight that each continent appears to adopt its own playing pattern when in offensive areas. European teams used possession techniques in offensive areas. South American teams appeared to use direct patterns in midfield areas and then adopt possession techniques in advanced offensive areas. African teams adopted possession techniques in midfield areas, similar to European teams, and utilised direct tactics in advanced offensive areas. Asian teams appeared to utilise direct techniques throughout the whole of the offensive areas.

It is apparent that football is not played in one particular way, but that each team has their respective strategies, patterns of play and tactics each with their respective successes in competitions. It is important that regular research is done at competitions to identify and monitor the playing patterns of teams.

Conversion of Attacking Play into Goals

The low frequency of scoring is one of football's characteristics which makes the objective evaluation of how attacking play can be converted into goals a critical dimension of the game that is worthy of comprehensive analysis (Yiannakos & Armatas, 2006). Research by Gargantua and Goncalves (1997) reported that among team sports, football presents the lowest success rate in terms of the ratio of goals scored to the number of attacking actions performed. Lucchesi (2001) used the following descriptors to define the qualities of a good attacking phase of play:

- Unpredictability: The team's ability to use a range of attacking techniques, modifying or varying them in order to put the opponents under pressure.

- Effectiveness: The teams' ability to score goals, with the acknowledgement that effectiveness is highly related to the quality of the principal striker in the team.

- Adaptability: The team's ability to adapt its attacking actions to the characteristics of the playing field, weather conditions and the playing style of the opponents.

Scoring a goal does not occur in isolation, but rather is as a result of a collection of actions that leads up to the scoring of a goal (Lanham, 2005). According to Luhtanen, Belinskij, Häyrinen and Vänttinen (2001), if a team is to score goals they must have effective ways to win the ball, create successful attacks first to reach the attacking third of the field, create real scoring chances and complete them by scoring goals with high efficiency.

The analysis of how scoring opportunities are created and how goals are scored was proposed by Hughes and Snook (2006) as the key to the discovery of effective styles of attacking play. According to Hook and Hughes (2001), both coaches and players may gain insight into how they can produce more quality opportunities to score goals by examining how goal scoring opportunities are created. Looking at the goals scored per match in World Cup competition, there appears to be a downward trend in the average goals per match (see Table 5). Hughes (1996) observed that this may be an outcome of a basically negative and defensive trend in styles of play since the 1960's. For example, in the 1954 World Cup, 140 goals were scored in 26 matches (average per game 5.4 goals) and the average goals per game were 2.5 in the 1986 World Cup. From the 1962 World Cup to the World Cup in 1998, there has been an average of 2.2 to 3 goals per game.

Table 5.

Statistics of Goals scored in the history of the FIFA World Cup (FIFA, 2009b).

World Cup	Teams	Matches	Goals Scored	Avg. Goals per Match
2006 Germany	32	64	147	2.3
2002 Korea/Japan	32	64	161	2.5
1998 France	32	64	171	2.7
1994 USA	24	52	141	2.7
1990 Italy	24	52	115	2.2
1986 Mexico	24	52	132	2.5
1982 Spain	24	52	146	2.8
1978 Argentina	16	38	102	2.7
1974 Germany	16	38	97	2.6
1970 Mexico	16	32	95	3.0
1966 England	16	32	89	2.8
1962 Chile	16	32	89	2.8
1958 Sweden	16	35	126	3.6
1954 Switzerland	16	26	140	5.4
1950 Brazil	13	22	88	4.0
1938 France	15	18	84	4.7
1934 Italy	16	17	70	4.1
1930 Uruguay	13	18	70	3.9
Mean	20.06	39.33	114.61	3.18
SD	6.63	16.34	31.56	0.89
Median	16.00	36.50	108.50	2.80

Hughes and Petit (2001) argued that although the goals-per-match average in football is lower than it was 40 years ago, football has not followed the negative and defensive trend as mentioned by Hughes (1996). Other reasons have been submitted to explain the trend of low scoring in tournaments and domestic competitions, including fatigue among elite players due to the overcrowded soccer calendar and the short period between the end of domestic leagues and competitions (Njororai, 2004). Football is undergoing constant transformation and as it has become increasingly popular

internationally, teams must travel and the level of training and development of players has reached a professional level in many countries (FIFA, 2004).

Another reason for the difference in goal scoring frequency could be due the evolution of football tactics. Football tactics have evolved dramatically, due in part to playing styles and to changes in the interpretation of the offside law (Ekblom, 1994). For example, in the late 1800's/early 1900's, teams used to play a 2-2-6 (2 defenders-2 midfielders-6 strikers) which was a very attacking formation based on the premise that if the opponents score five goals, then we will score seven. These types of formations were referred to as pyramid formations with the base of the pyramid being up with the strikers (Ekblom, 1994). However Wilson (2008) noted that a gradual inversion of the pyramid has take place with more players moving back from attacking positions into defensive positions.

An example of this progressive inversion of the pyramid occurred in the 1970 World Cup when Brazil made use of a 4-2-4 formation, which illustrates a slightly greater importance on defensive play, and not on all-out attack. Lucchesi (2001) explained that modern football differs in that it places a greater emphasis on formations that cover the greatest width and depth of the field in order to ensure balance, such as the 4-4-2 (most frequently used), the 4-3-3 (commonly used by Dutch teams), the 3-5-2 (commonly used in German teams), the 4-3-1-2 and the 4-5-1. These formations have resulted in the pyramid being turned around to create a bigger base in defence and a smaller investment in offense.

Limited research is available that is focused on how South African teams create attacking play that leads to goals. Table 6 presents a comparison between the archives of the league champions of England (English Premier League) and South Africa (Premier Soccer League). The league winners in England scored an average of 2.04 goals per game and conceded 0.84 goals per game since the establishment of the league in 1992/1993 (Premier League, 2009). Records from the South African Premier League (PSL, 2009) revealed that since the establishment of the PSL in 1996/1997, P.S.L. winners scored fewer goals (1.58 average goals per game) and conceded slightly fewer goals per game (0.75) than the English league winners. Because these data were limited to the league champions, one explanation for this difference could be that there is a difference in the depth of competition in England than in South Africa. For example, teams in South Africa may be more evenly matched which could produce lower scoring games, while in England the top

teams may be substantially better resourced than lower teams in the same league. Because there is no record of the tactics or formations used by any of these teams, it is not possible to draw conclusions from this observation of these differences in average goals per match.

Table 6.

Average goals scored per game for League winners in the English Premiership (Premier League, 2009) and South African Premier League (PSL, 2009).

Season	English League Champions		PSL Champions	
	Avg. Scored	**Avg. Conceded**	**Avg. Scored**	**Avg. Conceded**
2008 / 2009	2.00	0.63	1.50	0.73
2007 / 2008	2.11	0.58	1.30	0.87
2006 / 2007	2.18	0.71	1.50	0.57
2005 / 2006	1.89	0.58	1.50	0.63
2004 / 2005	2.29	0.39	1.83	0.86
2003 / 2004	1.92	0.68	1.30	0.37
2002 / 2003	2.24	0.89	1.37	0.53
2001 / 2002	2.16	0.95	1.44	0.88
2000 / 2001	2.00	0.81	1.76	1.00
1999 / 2000	2.55	1.18	2.00	1.00
1998 / 1999	2.11	0.97	2.06	0.76
1997 / 1998	1.92	0.87	1.41	0.73
1996 / 1997	2.00	1.16	1.56	0.82
1995 / 1996	1.92	0.92		
1994 / 1995	1.90	0.93	PSL Not yet established	
1993 / 1994	1.95	0.90		
1992 / 1993	1.62	1.09		
Mean	2.04	0.84	1.58	0.75
STD Dev.	0.20	0.21	0.24	0.18
Median	2.00	0.89	1.50	0.76

Because football is a low scoring team sport, then it is also important to better understand why goals are not scored. Hughes, Langridge and Dawkin (1998) specified that actions by the player with the ball, actions by the defenders, as well as actions by the receiver must all be considered potential causes for shots not being taken at goal and ultimately goals not being scored. They found at the 1996 European Championships that of the possible reasons for shots not being taken at goal, that actions associated with the

player in possession of the ball made up the majority of actions (47%) followed by positive actions by the opponents (41%) and lastly by actions by the receiver of the ball (12%). (see Figure 2).

- Of the actions by the player in possession of the ball, inaccurate passing accounted for the majority (47%) of possessions being lost, and resulting failure to take a shot at goal.

- Of the actions by the defensive team that prevented the attacking team from taking shots, interceptions made up the majority (68%).

- Of the actions by the recipient of the ball in attacking positions, a loss of control made up the majority (40.9%) of the receiver variables.

Studies such as the above highlight the myriad of factors that influence shots being taken at goal, and ultimately the conversion of these shots into goals. In order to take a shot at goal, the attacking player does not only have to concentrate on the technical aspects of controlling the ball and getting into a position to shoot at goal, but also concentrate on the position of the opponents, as they place the restrictions of space and time on the ball carrier, as well as the position of their team-mates. Scoring a goal in a closed environment is a lot different from scoring in a complex open system; therefore it is important that these factors are well studied.

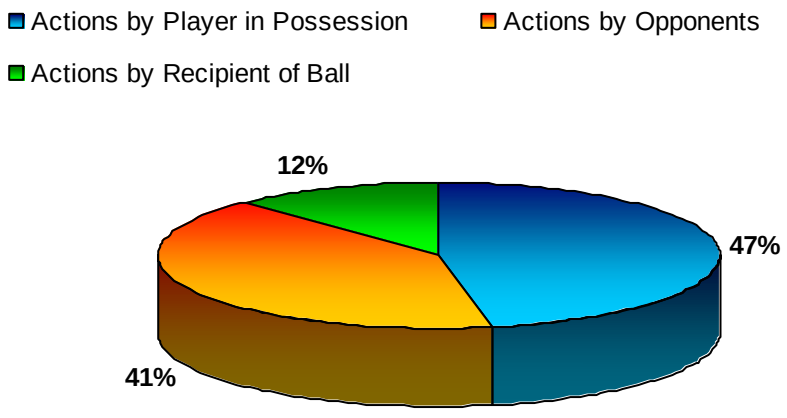


Figure 2. *Reasons for shots not being taken at goal at the 1996 European Championships (Hughes et al., 1998).*

Time in Matches when Goals are Scored

Researchers have addressed the temporal analysis of goal scoring patterns (Armatas, Yiannakos, Zaggelidis, Skoufas, Papadopolous & Fragkos, 2009a; Yiannakos & Armatas 2006; Carling *et al.*, 2005; Abt, Dickson & Mummery, 2002), and there is strong evidence that the majority of goals are scored in the second half of the match. In their study of the European Championships, Yiannakos and Armatas (2006) found that 42.6% of goals were scored in the first half and 57.4% of goals were scored in the second half. Armatas *et al.* (2009a) found in the Greek League that 54.1% of all goals were scored in the second half, and in particular with an upward trend with the number of goals scored towards the end of the halves (see Figure 3).

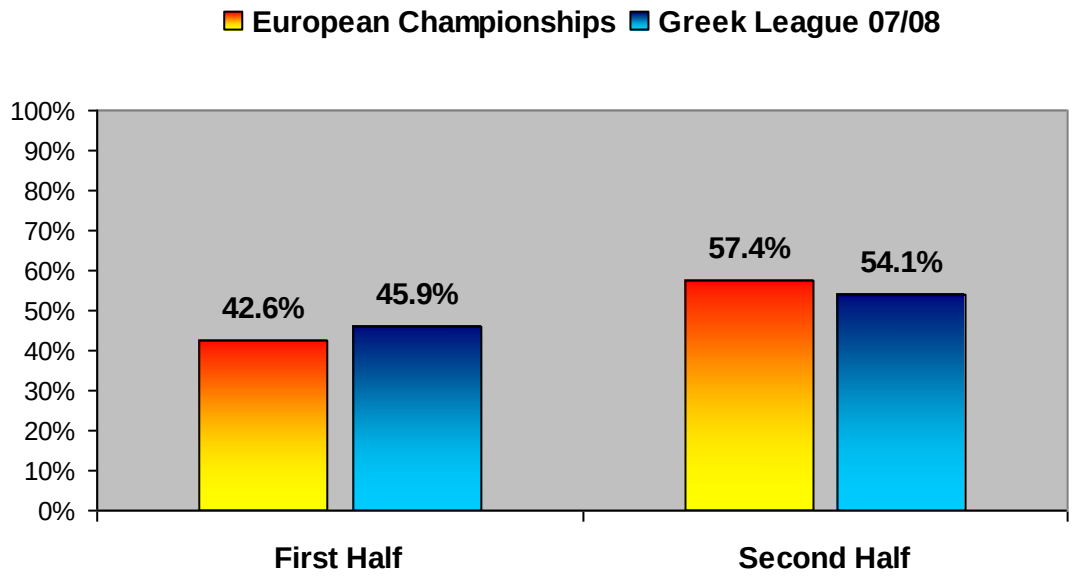


Figure 3. *Percentage of goals score in the first and second halves in the 2006 European Championships (Yiannakos & Armatas 2006) and the Greek League (Armatas et al., 2009a)*

Similar patterns were found by Carling *et al.* (2005) in his analysis of the 1998 and 2002 World Cup. He found that the majority of goals were scored early or late in each half, and that more than half of the goals were scored in the opening and closing 6-9 minutes of each half, including injury time. When Kirkendall, Dowd and DiCicco (2002) compared the men's 1998 World Cup and the Ladies 1999 World Cup, they found that a large percentage of the goals scored by the men's game occur late in the second half while goals in the women's game are more evenly spread through the game

The apparent time relationship between goals scored and time is an important factor to keep in mind, in particular regarding the fitness and mental skills training of players. A number of possible reasons can be given for the higher frequency of goals scored in the second half and in the closing minutes of a half.

- Performance may be inhibited in the second half and especially towards the end of the game as a result of fatigue (Mohr, Krustrup & Bangsbo, 2005). A greater deterioration in physical condition and concentration occurs amongst defenders as the match progresses thereby providing attackers with a potential advantage (Reilly, 2003).

- Players may be more willing, especially in important matches, to take greater risks towards the end of a match to bring about the desired outcome (Abt *et al*., 2002).

- A team may adopt a more attacking strategy as a result of being a goal behind and push players forward in order to create scoring chances (Carling *et al*., 2005).

Techniques Used to Score Goals

There is limited research into which parts of the body and techniques are used to score goals. Njororai (2004) found in the 2002 World Cup that most goals (76.4%) originated from the foot, while the rest (23.6%) were scored by the use of the head. Carling *et al.* (2005) found that the majority of goals scored during open play at the 2002 World Cup were scored with the laces of the boot (27%), followed by the inside of foot and head (22% respectively) the instep (21%), other (5%) and the outside of the foot (3%) (see Figure 4).

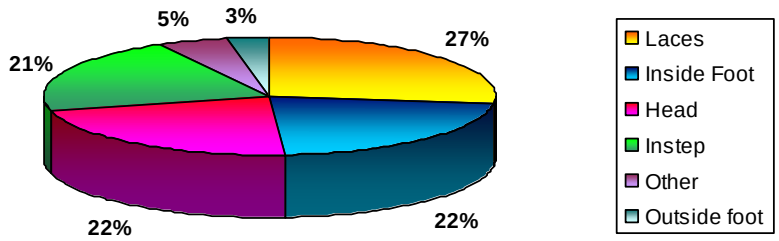


Figure 4. *al., 2005).*

In the European Championships in 2000, Hook and Hughes (2001) found that shots in the air, headers and half volleys, were utilised more by unsuccessful teams (teams that did not qualify past the group stages), and that they created 10.6% more shots than the successful teams did using these techniques. The majority of shots at goal by teams classified as successful (semi-finalists) were driven shots followed by placed shots and curled shots. These shots were taken most often with the laces of the right foot, followed by the instep of the right foot and laces of the left foot. The majority of shots taken by less successful teams were driven shots (more than successful teams), headed shots (more than successful teams) and placed shots with the laces of the right foot (more than successful teams), head (more than successful teams) and laces of the left foot. Placing the ball – regarded as the most accurate method of shooting - was utilised slightly more by successful teams than unsuccessful teams. This could be due to players of successful teams being able to relax more in front of goal, while players on unsuccessful teams may feel more pressure to score and opt for power instead of accuracy. They also found that successful teams tried more inventive shots such as flicks, lobs and curls, totalling 20.1% of their overall total, while unsuccessful teams only used these types of shots for 11.8% of their shots.

At the next European Championship in 2004, Hughes and Snook (2006) identified the most common method of shooting to be the driven shot. A total of 14% of driven shots were on target or resulted in a goal, and along with headed shots accounted for all the shots that were off-target. These results differed from those of Hughes and Petit (2001) who found that in the 1998 World Cup, the 16.7% of the strikes on goal that were placed resulted in goals, and 9.8% of the driven shots resulted in a goal. This contrast brings up the need for teams to look at how to create the optimal balance between precision and power when it comes to taking shots at goal.

Areas from which Goals are Scored

The majority of goals scored are converted from within the penalty area (Yiannakos & Armatas, 2006; Carling *et al*., 2005; Njorojai, 2004; Hughes *et al.*, 1988; Olsen, 1988). Olsen (1988) noted that 90% of goals scored in the 1986 World Cup were scored from within the penalty area. In their study of the 1986 World Cup, Hughes *et al.* (1988) found that players on the more successful teams took the majority of their shots within the penalty area. In the 2004 European Championships, Hughes and Snook (2006) found that all goals scored came from the two central positions closest to the opposition goals, with 85% of goals being scored from within the penalty area. This gives an indication that the teams were able to penetrate the central areas of the attacking third of the field into the penalty area with purpose.

Slightly different patterns can be found when the 2002 World Cup is compared to the 2004 European Championships (see Figure 5). Carling *et al.* (2005) report on the 2002 World Cup stated that the majority of the goals were scored from inside the penalty area, especially the area between the edge of the 6-yard box and the penalty spot (37% of all goals). They also reported that 29% of all goals were scored within the 6-yard box, 18% of all goals were scored in the area that extends from the penalty spot to the edge of the 18-yard box and 16% of all goals were scored outside the penalty area. In the 2004 European Championships, Yiannakos and Armatas (2006) found that 44.4% of goals were scored inside the penalty area, 35.2% inside the goal area (6-yard box) and 20.4% from outside the penalty

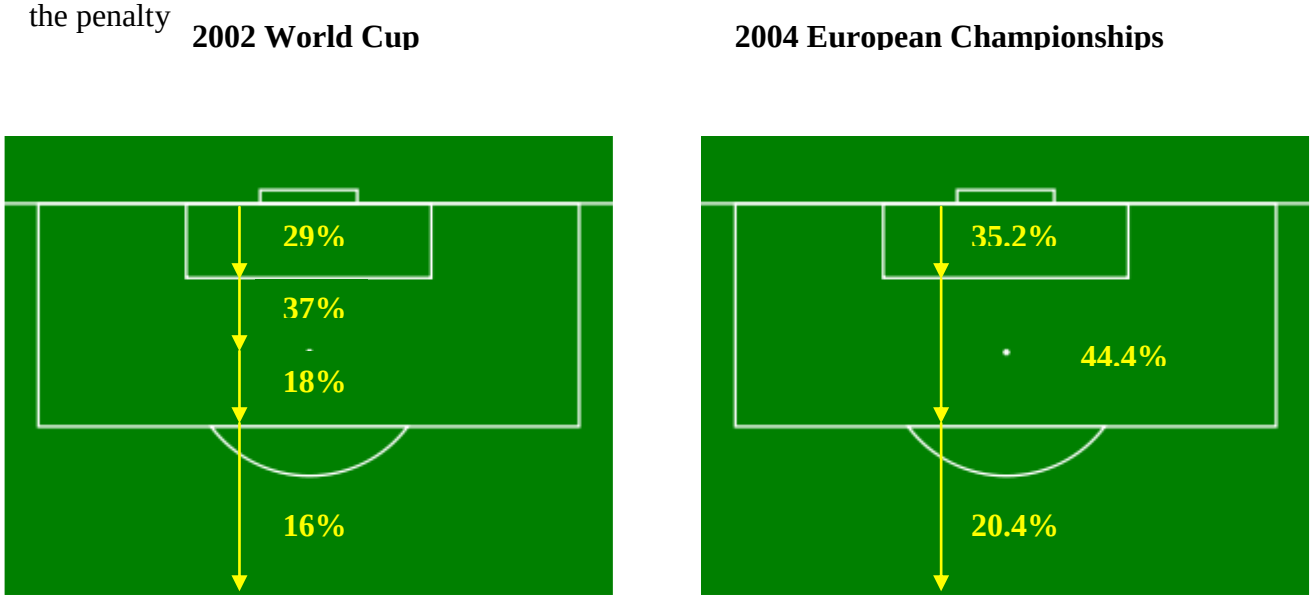


Figure 5. *.Areas from which goals were scored in the 2002 World Cup (Carling et al., 2005) and 2004 European Championships (Yiannakos & Armatas, 2006).*

In a study of top level Greek football, Armatas, Yiannakos, Zaggelidis, Papadopolous and Fragkos (2009b) noted that the top-ranked teams took more shots from within the penalty area than the lower-ranked teams. They reasoned that the successful teams could make more shots inside the penalty area because of their greater technical and tactical superiority, and lower-placed teams could not get as close to the goal area and so were forced to take shots from outside the penalty area.

South American teams were most effective in taking shots from within the penalty compared to teams from other continents in the 2002 World Cup, which was attributed to their effectiveness in penetrating the defence and performing shots in the dangerous area (Brown & Hughes, 2004). Hewer and James (2004) found that when playing European teams, the English team scored 85% of their goals from within the penalty area, and when playing teams from England, they scored 95% of their goals from within the penalty area. They explained this difference as an outcome of the defensive tactics of the opponents. It was observed that the European teams defended from deeper, allowing the English teams space and time in which to attack the opposition and prepare for a shot.

Horn, Williams and Ensum (2002) identified the central area just outside the penalty area as Zone 14. They suggested that 86% of passes into Zone 14 would subsequently enter the penalty area and therefore provide shooting opportunities. They recommended that the ball be played into Zone 14 as often as possible. These studies about the optimal areas from which to enter the penalty area highlight the importance of a team having the technical and tactical ability to manoeuvre the ball into the critical areas within the penalty area (where the chance of scoring is more likely) in order to take a shot at goal.

Passes before Goals

Lanham (2005) reported that there is a commonly believed ‘law of chance’ in football at all levels of play, that an average of 180 possessions are lost and won back in support of scoring a single goal. With this commonly held idea in mind, many coaches believe that the fewer possessions (and more direct style of play) before a team to score a goal, the more likely it is that that team will score goals more frequently. This may be why the number of passes prior to a goal being scored has been well studied, extending back to the work of Reep and Benjamin (1968) and then to Bate (1988), who found that the

majority of all goals were scored from four or fewer passes. Carling *et al*. (2005) found similar findings in his study of the 1998 and 2002 World Cups:

- The majority of goals scored in both competitions followed sequences of play involving between no passes and four passes.
- A reasonable proportion of goals (34%) were scored from sequences of play involving five to 11 passes, slightly higher than 1998 World Cup (26%).
- Five goals (6%) were scored following sequences of play involving more than 11 passes in the 2002 World Cup.

Hughes and Franks (2005) noted that the majority of goals came from team possessions of four passes or less in the 1990 World Cup (84%) and the 1994 World Cup (80%). Carling *et al.* (2005) reported that in the 1998 World Cup, three-pass moves provided the highest frequency of goals from open play reflecting the more possession-orientated style of play favoured by international teams. This was in contrast to his analysis of the 1997-1998 season of the English premiership, where the goals scored from open play involved build-ups with no passes (*e.g*. a snap shot following a clearance or rebound) or one pass, indicating a more direct approach to the attack. Carling *et al.* (2005) concluded that most goals are scored following sequences of play lasting between 6 and 10 seconds and involving fewer than three passes, but that successful teams are also able to create more goals than the opposition following longer passing sequences.

Research by Hewer and James (2004) focused on the number of passes leading to a goal found in the English Premiership, revealed that an average of 2.9 passes preceded a goal versus British opposition, and 3.2 passes preceded a goal against European opposition. This result was consistent with the observations made by James *et al.* (2002) that European teams exerted more pressure and forced play deeper into the defensive areas, resulting in a need for the offence to put together more passes prior to scoring a goal. Hewer and James (2004) also noticed that when facing English and European opposition, assists tended to originate from the offensive areas with the wingers playing an important role. European defences appeared to position themselves deeper in their own half, which created more space within the pre-offensive areas compared to the English teams who defended further up the field. This led to more use of long balls to the feet of the strikers who had dropped back into the pre-offensive area to receive the ball. During English

matches, the opposition tended to push up the pitch in a more aggressive defensive strategy, so more use was seen of the long ball in behind the opponent's defence.

The quality of the final pass (the assist) determines to a large extent whether the final touch results in an on-target shot at goal (Wein, 2002). Top teams in the Greek football league made a greater number of assists (whether they resulted in a goal or not) when compared to lower ranked teams in the league (Armatas *et al*., 2009b). These top teams performed an equal number of assists resulting and not resulting in goals. The bottom positioned teams performed a greater number of assists that did not result in goals than assists that did (see Figure 6). Armatas *et al.* (2009b) concluded that the top teams created more goal scoring opportunities due to the technical and tactical quality of their players.

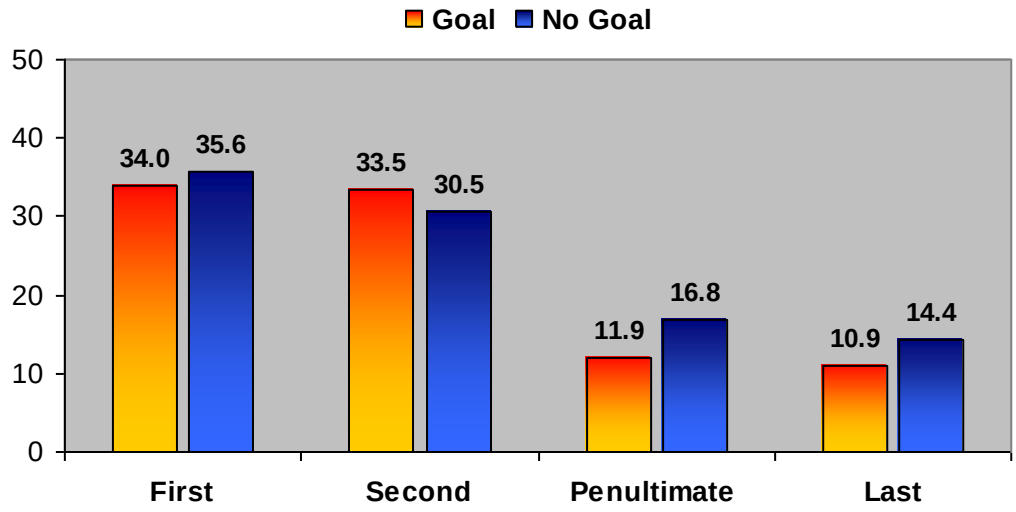


Figure 6. *Mean number of assists that were successful and unsuccessful during the 1998/1999-2007/2008 Greek League Season, (Armatas et al., 2009b).*

Wein (2002) identified a number of important technical and tactical factors that influence the quality of the execution of the final pass and reception of the ball that influence the scoring of goals:

- The type of pass: A simple pass (back or horizontal) secures possession in the attack but slows it down and eliminates any surprise factor. However, when the ball carrier plays a more risky diagonal and through pass, which is often

preceded by a feint or dummy, they are able to unsettle the opponents defence and often create clear goal scoring opportunities.

- Movement of Strikers: When a pass does not arrive in the attacking areas of the field, many attackers become impatient and drop back into the midfield in order to get back into the game. This may help the player for a while, but does not help the team create offensive situations or challenge the opponent's defence.

- Reception of the ball: The quality of the pass is critical to the quality of the reception and control of the ball. Receiving and controlling the ball in a side-on position and not a front-on position with the back towards the goal, creates more goal scoring opportunities. The side-on position gives the receiver a clearer view of what is happening in the penalty area, giving him a better chance to finish the attack successfully.

- Quality and reputation of the strikers: Top strikers often attract more than one defender, and this should allow their team-mates to have more space. Well-timed passes to these team-mates create offensive opportunities.

Shots-to-Goal Ratio

The ratio of shots to goals scored is also referred to as the strike rate or scoring efficiency and can be calculated for teams as well as individual players (Carling *et al.*, 2009). The shots-to-goal ratio is calculated by dividing the number of shots taken at goal by the number of goals scored. Szwarc (2004) found in the 2002 World Cup that teams classified as successful (semi-finalists) took on average 18 shots at goal per game, whereas teams classified as unsuccessful (did not qualify for the second round) took on average 14.08 shots per game. Hughes and Petit (2001) found the average strike rate for all teams at the 1998 World Cup to be 8.4:1. In comparing performance in two World Cups, Bell-Walker, McRobert, Ford and Williams (2006) calculated that successful teams had a 7:1 strike rate in the 2002 World Cup and an 11:1 strike rate in the 2006 World Cup. They also reported that unsuccessful teams had a strike rate of 22:1. These findings suggest that the more successful teams are able to create more efficient and effective attacking play than unsuccessful teams which can potentially be related to attacking strategies and tactics adopted by the teams, as well as the areas from which these teams take there shots.

Individual player ability in the more successful teams may also be of a better standard. In their analysis of the 2004 European Championship, Hughes and Snook (2006) divided the 16 teams into 3 categories based on their seeding going into the tournament. They found that the top ranked teams had a shot to goal ratio of 8.4:1, the middle ranked group a ratio of 12.6:1 and the lowest ranked group a ratio of 17.1:1 (see Figure 7).

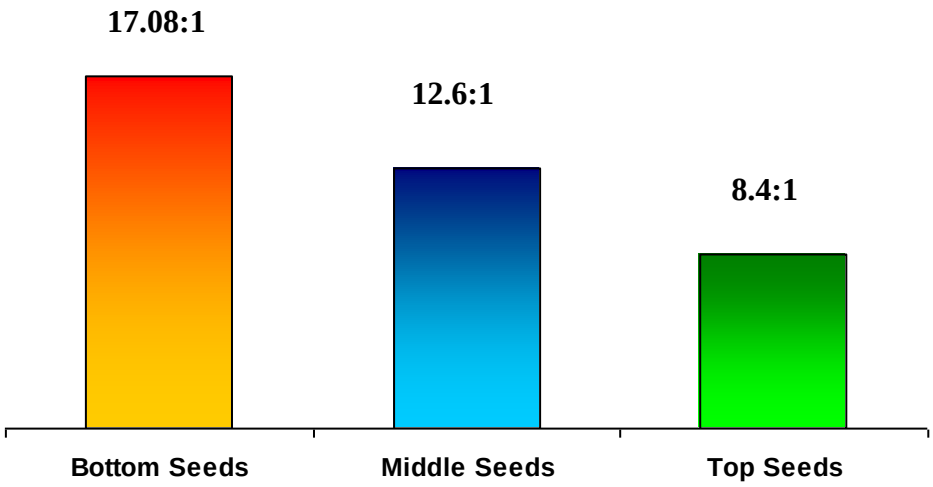


Figure 7. *Ratio of shots to goals at the 2004 European Championships (Hughes & Snook, 2006.)*

Carling *et al.* (2005) compared successful teams in different competitions (see Figure 8). In the 2002 World Cup, Brazil had a strike rate of 5:1. Manchester United had a strike rate of 9:1 in their 1999 treble winning season. It was interesting to note that France had the same strike rate in Euro 2000 and the 1998 World Cup (7:1).

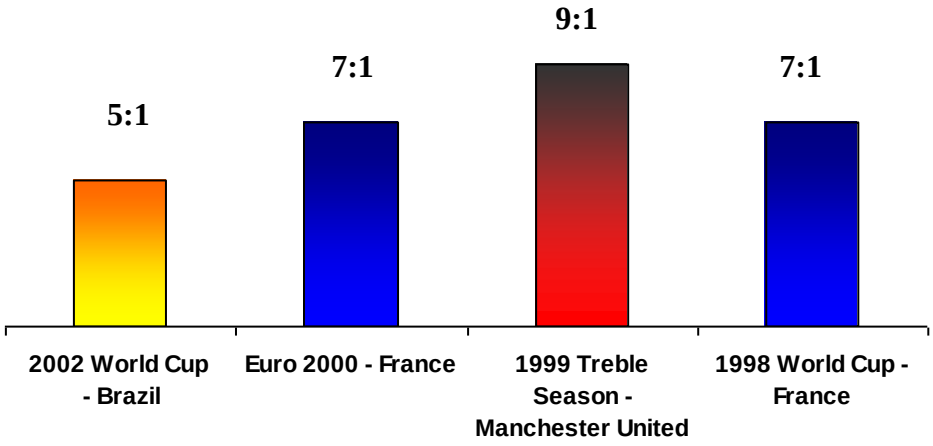


Figure 8. *Ratio of shots-to-goals by teams in various competitions (Carling et al.,*

Final Actions before Goals

The majority of goals in football are preceded by actions such as passes and crosses. According to Breen, Iga, Ford and Williams (2006) these actions combined accounted for approximately 70% of goals scored in the 2006 World Cup. Yiannakos and Armatas (2006) found that in the 2004 European Championships, the majority of goals (34.1%) were scored as a result of long passes. They found that 29.3% of goals resulted from combination play, 17.1% from individual actions, 14.6% from direct shots and 4.9% from own goals (see Figure 9).

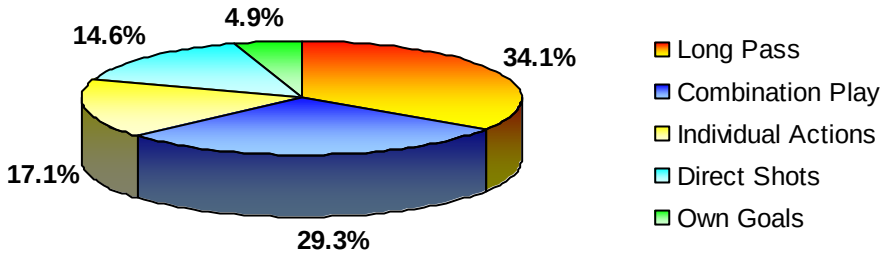


Figure 9. *Percentage of actions preceding goals at the 2004 European Championships (Yiannakos & Armatas, 2006.)*

Carling *et al.* (2005) identified three contrasts between the final actions before goals were scored in the 1998 and 2002 World Cups (see Figure 10):

1. The percentage of goals scored following a pass (29%) was much lower in the 2002 World Cup (29%) than in 1998 World Cup (47%).

2. The proportion of goals scored from crosses was much higher in 2002 (29%) than in 1998 (18%).

3. The percentage of goals following a turn or dribble was slightly lower in 2002 (14%) than in 1998 (20%).

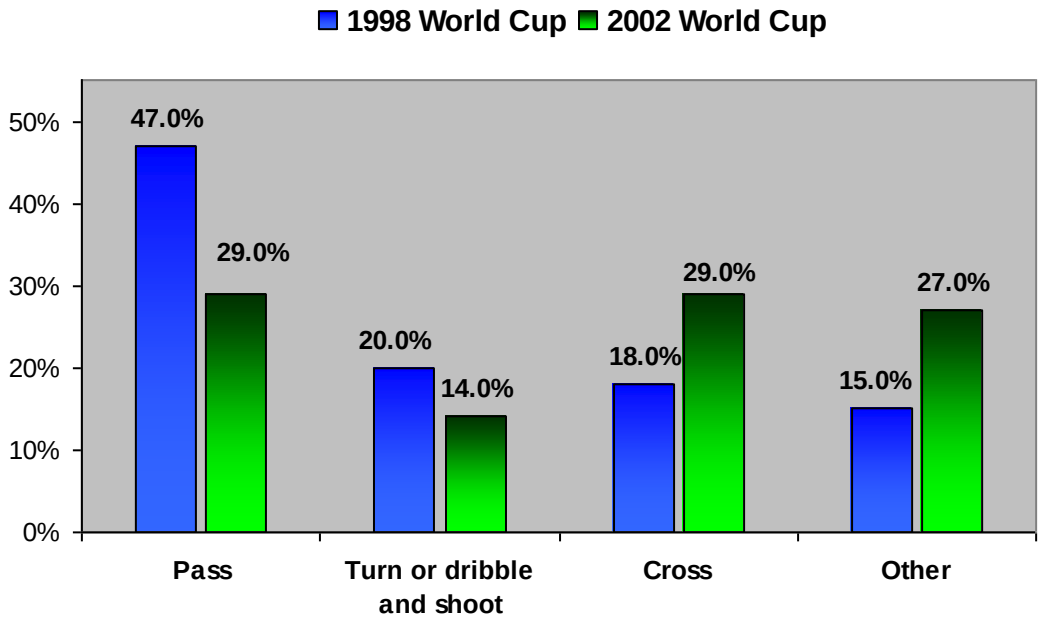


Figure 10. *Percentage of actions preceding goals at the 1998 and 2002 World Cup (Carling et al., 2005).*

In the 2000 European Championships, Hook and Hughes (2001) found that successful teams (semi-finalists) utilised more of the defence-splitting passes, (through-ball and over-the-top), while unsuccessful teams relied mainly upon aerial passes (cross, flick-on header) which tended to be less controlled and were associated with a more direct style of play. Successful teams tended to vary between the short and long pass, totalling 36.5% of all their last passes, which shows how they were able to play along the ground and utilise possession style of play. Recent research documented an upward trend across World

Cup winners in the importance of dribbling as a final action preceding shots on goal (Yates, North, Ford & Williams, 2006).

The Set Piece

A significant proportion of goals are scored either directly from the set piece itself or indirectly after being cleared and then immediately being played back into the danger area. Studies have highlighted that the percentage of goals scored directly or indirectly from set plays make up approximately a third of the total number of goals scored (Yiannakos & Armatas, 2006; Njororai, 2004; Bangsbo & Pietersen, 2000). Some teams adopt a method of offensive play that promotes the occurrences of set pieces because they have specialists in its execution (Sousa & Gargantua, 1998).

In football set pieces include a free kick (indirect or direct, including a penalty kick), throw in, corner kick and goal kick (however most studies have excluded this variable). They are awarded as a result of an infringement of the laws, or as a result of the ball going outside the field of play for a corner, throw in or goal kick. According to Carling's *et al.* (2005) observations of the 2002 World Cup, the most frequent occurrence for free kicks in the attacking third were after a player had been fouled when running or dribbling past a defender, followed by a foul on the player as they receive the ball, and then after a challenge or tackle that was in the opinion of the referee a foul. Sousa and Gargantua (1998) found that the method of offence that resulted in the occurrence of the most number of set-plays, was positional attack followed by fast attacks. They found that penalty kicks were conceded mainly as a result of counter attacks.

A direct free kick is awarded to the opposing team if a player kicks or attempts to kick an opponent, trips or attempts to trip an opponent, jumps at an opponent, charges and opponent, strikes or attempts to strike an opponent, pushes an opponent, holds an opponent, spits at an opponent, handles the ball deliberately (except for the goalkeeper in their penalty area), or tackles an opponent to gain possession of the ball, making contact with the opponent before touching the ball (FIFA., 2009a). A penalty kick, which is also a direct kick, is awarded if any of the above ten offences is committed by a player inside their own penalty area.

An indirect free kick is awarded to the opposing team if a player in the opinion of the referee plays in a dangerous manner, impedes the progress of an opponent, and

prevents the goal keeper from releasing the ball from their hands (FIFA, 2009a). An indirect free kick is also awarded to the opposing team if the goalkeeper takes more than six seconds while controlling the ball with their hands before releasing it from his or her possession, touches the ball again with their hands after it as been released from their possession, and has not touched any other player, touches the ball with their hands after it has been deliberately kicked to them by a team-mate or thrown to them from a throw-in. A throw-in is awarded from the point from where the whole of the ball crossed the whole of the touch line on the ground or in the air.

A goal kick is awarded when the whole of the ball, passes over the goal line, either on the ground or in the air, having last touched a player from the attacking team without a goal being scored (FIFA, 2009a).

A corner kick is awarded when the whole of the ball passes over the goal line, either on the ground or in the air, having last touched a player of the defending team, without a goal being scored (FIFA, 2009a).

According to Bangsbo and Peitersen (2000) approximately 20 dead ball situations appear on average for each team in every match. These figures are slightly less than compared to Carling *et al.* (2005), who found that international football teams have an average of 12 indirect free kicks, 2 direct free kicks, 17 throw-ins and 5 corner kicks in the attacking third per game, with slightly higher figures in domestic football. They also observed that although there has been an overall decrease in frequency of set plays in recent years, there has been a significant increase in efficiency, with more goals being scored from fewer set pieces. Carling *et al.* (2005) closed this discussion stating that successful teams are more efficient in converting set pieces into goals (7:1) compared to less successful teams (15:1).

In their study of the 1998 World Cup, Grant, Williams and Reilly (1999) found that 50% and 47.6% of the goals scored from set pieces came from free kicks and corners respectively. Figure 11 presents a comparison between scoring from set pieces from two international championship events. In the 2004 European Championships in Portugal, Yiannakos and Armatas (2006) found that of the goals that were scored from set pieces, 40% were scored from corners, 30% from free kicks, 25% from penalties and 5% from throw-ins. Sousa and Gargantua (1998) found that at the 1994 World Cup, the set pieces

that led to goals were from direct free kicks (42%), penalty kicks (29%), indirect free kicks (4%), corners (13%) and throw-ins (12%). When direct free kicks and indirect free kicks were added together, they total 46% for free kicks in the Sousa and Gargantua (1998) study. These studies highlight the importance of making good use of set pieces, in particular from corners and free kicks.

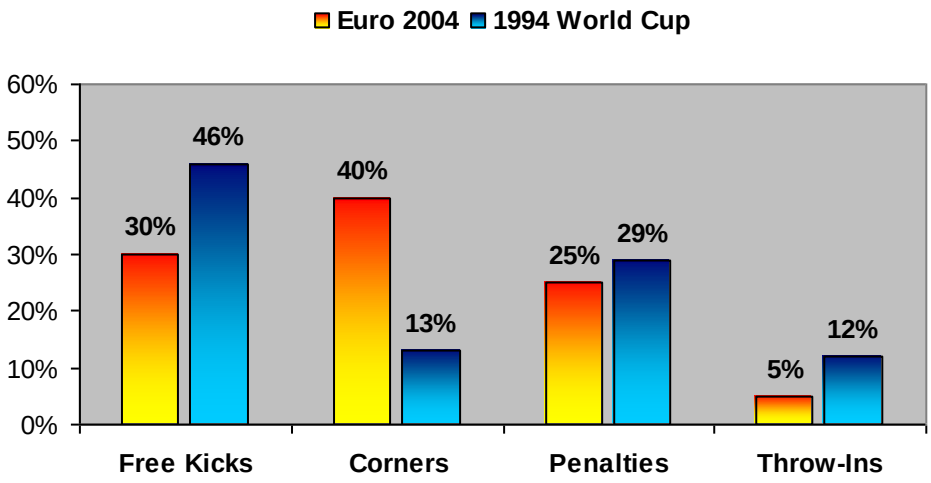


Figure 11. *Percentage of goals scored from set pieces in the 2000 European Championships (Yiannakos & Armatas, 2006) and 1994 World Cup (Sousa & Gargantua, 1998).*

Corner Kicks

In the 2002 Soccer World Cup, the majority of first and second phase goals from corners came from a direct cross into the penalty area (18 of the 21 goals scored) (Carling *et al*., 2005). In a study of the Norwegian national football team and their opponents, Olsen & Larsen (1997) reported an average of 10.4 corner kicks per game and found that in-swinging corner kicks had the best chance of leading to an attempt at goal (3:1) and that the ratio was 5:1 for out-swinging corners. They also found that 15% of corners led to an attempt at goal.

At the European Championships in 2000, there were a total of 338 corner kicks, averaging 10.9 corners per match (Hill & Hughes, 2001). Of the 85 goals scored at the competition, 6 (7%) were scored directly from corner kicks. Of the 338 corners, 23 (7%) of the corners produced an attempt that was on target, and 45 (13%) corners produced an attempt that was off-target (not at the goal). These calculations lead to the observation that

there was one attempt/chance to score a goal for every five corners taken (20%). Hill and Hughes (2001) observed that the most effective corners were those that:

- Curled either towards the goal or away from the goal.
- Hit above head-height (either clipped or high lofted).
- Where the first contact of the ball is made either in areas to the front of the goal (for left side corners) or area to the back of the goal (for right side corners).

They recommended that the number of actions involved at the corner should be limited to no more than two in order to produce an attempt at goal (Hill & Hughes, 2001).

A study by Taylor, James and Mellalieu (2005b) found that of the corners in the English Premier League in 20 matches of the 2001/2002 season six goals (10.2% of the goals) were scored as a direct result of corner kicks (see Table 7). Of the 217 corner kicks examined, 68 (31%) resulted in an attempt at goal. Of these, 8% resulted in a goal, 49% in shots off target and 43% in shots on target. Out-swinging corner kicks produced the most attempts at goal, with the majority off-target (60.7%). The in-swinging corner kick was found to produce the greatest number of goals scored (66%). Although corner kicks occurred frequently (mean of 10.86 per game) and provided many goal scoring chances (1 in 3) opportunities were only converted into goals 1 in 11 times. Findings by Carling *et al.* (2005) confirm that in-swinging corners are generally more successful in creating goals, and appear to be up to three times more successful than out-swinging corners.

Table 7.

Breakdown of corner kick styles with special reference to attempts on goal in the English Premier League (Taylor et al., 2005b).

Corner Style	Frequency	Unsuccessful Outcomes	Success Rate %	Goals	On-target Shots	Off-target Shots
Inswing	79	57	28%	4	11	7
Outswing	66	38	42%	1	10	17
Straight	36	28	22%	0	3	5
Chipped	9	6	33%	0	3	0
Short Corner	27	20	26%	1	2	4

The placement of the ball from a corner kick may be directly or indirectly into the penalty area. Carling *et al*. (2005) described in-swinging corners to the near post and mid-goal region as the most successful, although the chances of losing possession or being caught on the counter attack are greater than with an out-swinging corner. Out-swinging corners were successful, particularly when directed between the penalty spot and the far post. Taylor *et al.* (2005b) stated that the most critical area to play the ball into from corner kicks was along the front of the six-yard box. Corner kicks swinging into this area were likely to provide the most attempts at goal, although the in-swinging style appeared to result in the best chances of creating a shot on target or a goal. They also found that corner kicks placed in the area just outside the penalty area also had a high success rate; however, such a set piece is more difficult to execute.

An interesting question to ask is whether playing position will have an influence on an attempt at goal or goal scoring patterns. Taylor *et al*. (2005b) explained that regardless of the style of kick adopted, the player making the first contact whether they be a defender or striker is critical in defining the corner kick outcome. They found that attackers make first contact with the ball 80% of the time at successful corners and 27% at unsuccessful corners. This highlights that in general it is advisable for an attacking player to make the first contact with the ball from the corner in order to maximise the chance of creating a goal attempt. The setting-up of players in strategic positions before taking the set piece is important, although the element of surprise is also beneficial as the opposition can be caught unaware and disorganised.

Carling *et al*. (2005) concluded that short corner kicks are far more effective when the time from the corner kick being awarded to being executed is less than 20seconds. Similarly, short corner kicks involving a pass and a direct pass into the penalty were also more successful if taken quickly. Corner kicks played directly into the penalty area were more effective when the preparation time was greater than 20seconds, thereby allowing teams to send defensive players into the attacking penalty area and to organise effectively for the expected ball delivery.

Throw-Ins

Goals scored from throw-ins were not a frequent occurrence, and in a study by Yiannakos & Armatas (2006) 5% of the goals scored from free kicks came from throw-ins, However, in the 2002 World Cup, Carling *et al.* (2005) reported that throw-ins were the most common set play in the attacking third, with an average 17 per game. Nine goals were scored in the 2002 World Cup immediately following throw-ins compared to three in the European Championships in 2000. The majority of these goals came from a short throw followed by a cross into the penalty area and the shot at goal. The long throw was used infrequently in the tournament, and only one goal was scored in the whole tournament from a long throw. The likelihood of losing possession and being faced with a counter attack is higher from a long throw than from a short throw.

Additional Factors that Affect Game Outcome

The technical and tactical performance of players and teams, as well as the results of matches can be influenced by a number of situational variables. According to Nevill and Holder (1999) empirical evidence drawn from studies focused on win/loss records and tournament rankings, found that situational variables such as match location and the quality of the opposition faced have a critical impact on the outcome of games. Subsequent research completed by Johnston (2008), Taylor, Mellalieu, James and Shearer (2008) and Carling *et al.* (2005) added the factors of the referee and match status to match location and quality of opposition on the list of factors that impact on the outcome of games.

Match Location

Research from a range of sports has explored the extent of the home ground advantage (Carron, Loughhead & Bray, 2005; Pollard & Pollard, 2005). Most of these studies have attempted to determine if a larger base of spectator support (home crowd) and knowledge of the environment would give a team an advantage, usually reflected by looking at won-lost records. In a different approach, Neave and Wolfson (2003) found that players had higher testosterone levels in home matches than when playing away. They associated these levels with a natural response to defend one's own territory that could contribute to higher rates of success. However, research by Carling *et al.* (2005) illustrated the complexity of linking physiological states to home ground advantage. They found that

home ground advantage was more evident in European Cup Matches than in local derbies where players perform in front of their home supporters. He speculated that those players who are susceptible to stress might have difficulty coping with the home ground pressure, which in turn could have a negative influence on their performance. Both of these researchers have put forth unproven assumptions, but their points of view are illustrative of the complexity of studying home ground advantage.

Sanderson (1996) stated that there is no doubt that the home ground advantage exists to some degree, but that there is considerable debate as to why it exists. Pollard & Pollard (2005) and Nevill and Holder (1999) hypothesized that there are a number of contributing factors such as crowd support, travel fatigue, familiarity with conditions, referee bias, special tactics executed by the teams and psychological factors that may all play a role in the home ground advantage. The following two sections will focus on statistics related to win-lose records playing on home ground and the size of the crowd of spectators.

Home Ground Advantage

According to Carling *et al.* (2005), home ground advantage is documented in the records of the English Football League that reveal an annual average above 60% for points scored by the home team, a trend that can be traced back to the inception of the league in 1888. Pollard and Pollard (2005) completed a retrospective analysis of home advantage for English Football, and noted that in the early years of the League, home ground advantage was linked to 70% of the league points gained. They observed a slight decline to values blow 65%, but by the 1930's home ground advantage was averaging around 67%. Since the late 1980's annual values below 60% have occurred. For example, the same researchers calculated points gained by the home team as 62.8% (2000-2001), 57.4% (2001-2002) and 62% (2002-2003) over the span of three seasons of the English Premiership.

Armatas *et al.* (2008a) completed an analysis of the results of the 2007-2008 Greek league. They found that the home team won 51.9%, lost 24.7% and drew 23.4% of their matches. A similar distribution was evident in the 2006-2007 when 47.3% of matches were won by the home team. Armatas *et al.* (2009a) concluded that there is a definite advantage for the home team in football matches.

In a case study of one professional British football team, Sasaki, Nevil and Reilly (1999) found that more goal attempts, shots blocked, shots on target, shots wide, successful crosses, and goal kicks were performed during home than away matches. Tucker, Mellalieu, James and Taylor (2005) found similar results with an English football team, noting that they performed a greater number of corners, crosses, dribbles, passes, shots, performed more successful aerial challenges, crosses, passes, and tackles during home matches than during away matches. They also found that this particular English team performed more clearances, goal kicks, interceptions, and losses of control when playing away matches.

Taylor, Mellalieu and James (2006) examined differences in the behaviours performed by specific playing positions according to match location. They found that during home matches, midfielders performed more dribbles and shots than when playing away matches. They also found that there was an increase in clearances by goalkeepers and rule violations by forwards during away matches as compared to home matches. However, their final conclusion that was that game location did not have a significant impact on football performance when analysed with regard to specific playing positions.

Crowd Size

When playing at home, a team usually has the benefit of having greater spectator support base than at away matches. However, it must be acknowledged that a team can go through a period when their supporters at home matches do not provide a positive environment. In their study of the English Premiership, Boyko, Boyko and Boyko (2007) concluded that the larger the attendance at a match, the better the home team's performance. Johnston (2008) found this conclusion too simplistic. His analysis revealed that many of the clubs played their matches in front of near-capacity crowds at every match which means that crowd size by itself is not that powerful a variable. He also found that among those teams that did not attract capacity crowds for every home match, there was a tendency for the largest crowds to be for those matches against the strongest teams in the league. For these matches in particular, he felt it was not possible to assume that the crowd was supporting the home team since many of the spectators in the crowd were supporting the strong visiting team.

Johnston (2008) concluded that there was insufficient evidence that variations in crowd size had any impact on the outcome of a match. He did suggest that the possibility that the stronger the home team, the greater the home advantage and the stronger the away team the smaller the home ground advantage, should be explored. Since the teams with the greatest variation in crowd size tend to be among the weaker teams, they are the teams that suffer most when the stronger teams play at their ground. These factors highlight the complex nature of the interaction between home ground advantage and variable of crowd size.

Quality of the Opposition

Madrigal and James (1999) proposed that there is a relationship between opposition quality and match location. Their position was that strong teams have a greater home advantage against weaker teams than against teams of comparable quality, and that weaker teams have a greater home advantage against teams of comparable quality than against stronger teams. Other studies (Hughes & Churchill, 2005; Hughes & Franks, 2005) have looked at the quality of opposition in competitions, and the differences in performance based on this distinction. Hughes and Churchill (2005) found in the 1990 World Cup that teams classified as successful based on their performance in the tournament, had more shots at goal when compared to teams classified as unsuccessful.

Care must be taken when determining what determines the quality of the opposition. Taylor *et al.* (2008) cautioned that a team achieving success in a particular tournament may not necessarily be of high quality, and a team that was unsuccessful may not necessarily be of low quality. They noted that advancing or being eliminated from a tournament can be due to many other factors, including competition format and the draw of opponents faced in matches. They concluded that data gathered about final placements in a tournament potentially mask the factors that contribute to each team's success or failure in the competition. They recommended that individual case studies of teams be undertaken over a sustained period of time in order to gain a more accurate description of a team's performance in relation to quality of opposition.

The Referee as a Factor

Football matches are under the authority of the referees who are responsible for enforcing the laws of the game in an impartial way. Referees are undoubtedly under pressure and at times have been accused of favouring one team over another. For example, in the Boyko *et al.* (2007) study of an English Premiership season, they claimed that referees are partially responsible for at least some of the observed home ground advantages in the league. Sanderson (1996) stated that it is widely believed that football referees are more reluctant to give penalty decisions against the home team. Nevill, Newell and Gale (1995) provided evidence that the visiting teams in the English and Scottish Football league matches are penalised more often than the home teams and that this imbalance increases the larger the crowd size.

Neave and Wolfson (2003) speculated that it could be the noise created by the crowd that influences the referee subconsciously to favour the home team. Crowds loudly express either their anger or their approval of a referee's decision immediately following a call, which acts as a reinforcement mechanism on the decision. In order to control for the influence of the crowd noise on referee decisions, Nevill, Balmer and Williams (2002) showed a videotape of 47 tackles from an English Premiership League match to 40 qualified referees, who were then asked to classify a tackle as clean or as a foul. The referees were informed about the colours of the home and visiting teams, and were split into two groups. One group heard the noise of the crowd's reaction, while the other group watched the tackles silently. The group that heard the crowd's reaction was markedly more reluctant (by approximately 15%) to classify tackles made by the home team as fouls, and they were more often uncertain about their decisions. The decisions made by the group of referees who heard the crowd's reaction were significantly more compatible with the decisions made by the original match referee, when compared to the decisions made by the group who had watched the tackles in silence.

Decisions need to be made quickly by the referee, implying a large time constraint on the referee. Wallsten and Barton (1982) have shown that under time pressure people tend to focus on what they consider to be the most salient cues to make a decision. Crowd noise in the form of approval or disapproval could serve as a salient cue that could bias the subsequent decisions made by a referee. Sutter and Kocher (2004) found that in the German Bundesliga, referees were much more likely to award penalties to home teams

than to visiting teams, *i.e.* visiting teams are refused a legitimate penalty significantly more often. Nevill, Balmer and Williams (2002) discovered that referees tend to penalise home teams less often for the same type of tackles for which they penalise visiting teams. Sutter *et al.* (2004) also found that referees add significantly more extra time when the home team is behind by a goal or when there is a draw after 90 minutes, than they add when the visiting team is behind.

Match Status

The status of a match in terms of score puts each team into one the following three situations: Leading, trailing or drawing the match. A number of studies have looked at the match status and its relationship to tactical aspects (Bloomfield, Polman & O'Donoghue. 2005; O' Donoghue & Tenga, 2001) and technical elements (Taylor *et al.*, 2008; Jones, James & Mellalieu, 2004). In the 2006 World Cup, the team that scored first won the match 73.21% of the time (Armatas & Yiannakos, 2008). Armatas *et al.* (2008a) found in the Greek League that the team that scored the first goal won the match 71.4% of the time in the 2006-2007 season, and 74.2% in the 2007-2008 season (Armatas *et al*., 2009a).

An analysis by Jones *et al.* (2004) revealed that when teams were losing, they had longer possession periods with the ball, and that shorter possession periods were evident when they were winning. They also found that both successful and unsuccessful teams had longer duration possessions when losing than when winning. Findings by Bloomfield *et al.* (2004) in their study of teams ranked in the top three of the English Premiership, supported those of Jones *et al.* (2004). The frequency of play was increased in both attacking and defensive zones for all three teams when the match status was in a draw compared to when a team was winning or losing. This is an indication of the relationship between tactics and match status. These top three teams were also in possession of the ball less when the score was level (status of a draw) than when in winning or losing position.

There has been speculation by sports commentators that football players are influenced by the score line during a match with some teams being described as 'sitting on the lead' when ahead or energetically 'chasing the game' when behind (Shaw & O'Donoghue, 2005). A study of the English Premier league found that players spent a greater percentage of match play performing high intensity activity (work rate) when the score was level than when their team was leading or trailing (O'Donoghue & Tenga,

2001). However, a subsequent study did not find that scoreline significantly influenced the work-rate on English Premiership football teams (Bloomfield *et al.* 2004).

In Irish Amateur first division teams, Shaw and O'Donoghue (2005) found that players performed significantly less play at high intensity when their team was ahead than when the score was level. O'Donoghue and Tenga (2001) suggested that regardless of match status, work rate would likely be reduced when players perceive the outcome of the match to be outside their control. Shaw and O'Donoghue (2005) presented the possibility that when a football team takes the lead in a match, players on the team may actually attribute this match status to factors outside their own control, *e.g.* weaknesses in opposition, quality of teammates, officiating, and match venue. Perceptions such as these could lead players to believe the outcome of the match is obvious and outside of their control, which may result in a reduction of their work rate. The potentially confusing relationship between score line (match status) and match intensity indicates that more research is required in this area.

Summary

From the literature, it can be seen that football takes place in a complex environment, with factors both on and off the field influencing the way in which the game is played. National and club teams from all over the world have their own styles of playing the game based on their strengths, weaknesses and specific match-day strategies and tactics.

The pinnacle of attacking play is the conversion of an opportunity into a goal. It is by scoring goals that matches and tournaments are won, and by which success in professional football is determined. Goals can be scored from a variety of combinations of events, and the trends in the goal scoring patterns by a team gives a good indication of the team's relative strengths and weaknesses in terms of attacking play. The common event shared by all goals is the entry of the ball into the penalty area. Although this makes the penalty area the hub of goal scoring activity, no previous research was found that concentrated on what happens within the penalty area as the focus of attacking play.

Performance analysis was applied in this study in order to analyse the performance of a single professional football team in relation to trends and patterns of play associated

with entries of the ball into the penalty areas. In order for a team to develop their goal scoring ability it is important that these patterns are identified so that coaching interventions can be implemented that will help the team score goals more efficiently and effectively. A case study methodology is described in the next chapter because it was determined that this approach is the most meaningful because every team has its own particular style and potential, It is only by means of objective analysis of a specific teams that trends can be identified that apply to its own style and potential.

Chapter Three

Methodology

This chapter provides a brief description of the research design followed in this study, a description of the procedures followed in the implementation of this study and an indication of how the data generated in this study was analysed.

Design

This study followed a descriptive case study design in which performance analysis was implemented in order to observe, describe and analyse the penalty area entrances of a South African soccer team competing in the PSL, and then made comparisons to previous research done on international club and national teams. The descriptive study design is recommended when the purpose of research is to describe a particular phenomenon that may be unique to the individual or group being studied (Gratton & Jones, 2004) in this case looking for patterns in the attacking play and penalty area entrances of a single team.

In order to describe a particular phenomenon fully, a system to guide observation of the phenomenon as well as the generation and organisation of data needs to be implemented. In the field of performance analysis this takes the form of a category set (Carling *et al.*, 2005). The penalty area entrances of the team over the course of 10 home matches were analysed using a category set designed by the researcher. The category set was specifically focused on patterns of actions surrounding penalty area entrances and subsequent efforts to score goals. The results of this analysis were then compared to information generated through previous research on the attacking play associated with penalty area entrances of other football teams playing at national and international levels.

Procedures

The following procedures were followed in this study.

Identification of the Case Subject (Team)

One team from the PSL volunteered to participate in this study. The team was a client of the Stellenbosch University Sports Performance Institute (SUSPI) and had already contracted with the Institute for digital video computer-based performance analysis of their home matches. The coach of the team was interested in the topic for this study as described to him by the investigator. He was aware that the study would require only a re-analysis of the games already taped for his coaching staff, and he agreed that the study with its unique category set could be completed after the end of the competitive season.

A formal proposal outlining the nature and purpose of the study was sent to the coach and chairman of the football club. Written permission was granted by the club to the investigator to make use of the footage of the matches for the purpose of the study, providing the investigator ensured that both the team and all its players would remain anonymous in the presentation of the results in any format. An application to conduct the research proposal was then submitted to and approved by Ethics Subcommittee A of Stellenbosch University. The materials supporting this approval are provided in Appendix A.

The team is the single case in this study. It is regarded as an intact group, consisting of squad of players contracted to the club, who follow a professional training schedule. They compete according to the European season calendar in order to allow for International matches and competitions throughout the year. This means that football teams have relatively large squads, and the match-day squads and starting line-ups vary according to circumstances due to injuries, player suspensions, coach's selection of squads and game strategy in relation to a particular opponent, as well the weather conditions. For the purpose of this study, the performance of the team as a whole was observed and analysed, and no individual player analysis took place. Players were kept anonymous, and no records of starting line ups, playing positions and substitutions were kept. The elevated camera angle did not allow for the easy identification of specific players by name.

Filming and Real-time Analysis

The original filming took place at two different venues at which the team played their home matches. Nine matches were played at one venue, and one of the matches took place at the second venue. Season ticket media passes were provided by the PSL team, which meant that the matches could be recorded from the media area which is at elevated position providing an optimal vantage point from which to film.

A research assistant with experience in filming team sports assisted the investigator by managing the camera while the investigator conducted the real-time analysis according to a category set created in partnership with the coach. The live footage streamed into a Sony VAIO laptop from the video camera using a fire wire cable. Soccerstat software was used during the real-time analysis to record clips of specific parameters that the coach had predetermined.

All games were filmed using a Panasonic 50Hz digital video camera set on a tripod at an elevated vantage point positioned in line with the halfway line of the field. The following steps were involved for all of the 10 matches filmed during the research:

1. Confirm availability of camera, tripod, batteries, power cords DV digital tapes, Sony VAIO laptop, external hard drive and firewire cable and ensure that the equipment is in working order.

2. Gain access to the stadium using the media card at security checkpoint and make way to the media area.

3. Set up the video camera and tripod in a suitable position for optimal filming of the games

4. Position the laptop computer and external hard drive in close proximity to the camera and connect them using a firewire cable. Ensure that the computer and camera are connected and that the image that appears on the camera also appears on the laptop computer on the Soccerstat interface.

5. Insert DV tape, make sure it is rewound to the beginning and then test the video camera. Identify and correct camera positioning errors (if any).

6. Type the names and date into the Soccerstat programme and create a file for the match. Begin to code as soon as the match begins.

7. Begin to film the game with the central point of focus on the ball with a wide angle of the field to include as much of the field and players off the ball as possible. The entire match is filmed without pausing except during the half time interval.

8. At half time remove the DV tape used for the first half and replace it with a new tape for the second half and ensure the tape is rewound to the beginning.

9. Stop filming and analysing at the end of the match. Eject the tape and store safely. Pack away the equipment.

The video records of each match were then analysed and presented to the coach and team according to the contract with the SUSPI. The video records were subsequently stored so that they could be recalled after the end of the season for use in this study.

Development of the Category Set

A special category set was designed for this study that focused specifically on attacking play associated with penalty area entrances and the reasons for the different outcomes from those entrances, over 10 matches (see Figure 12). The category set designed and used in this study made use of six levels, each with its respective options. The six hierarchical levels consisted of:

1. The area of final action into the penalty area (18 options).

2. The area of the penalty area entrance (5 options).

3. The method of entrance (12 options).

4. The number of completed passes in the penalty area (4 options).

5. The outcome of the entrance (8 options).

6. The possible reason for this occurrence (13 options).

1. Area of Final Action into the Penalty Area																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Other

2. Area of Penalty Area Entrance				
Right Side	Right Front	Left Side	Left Front	Other

3. Method of Penalty Areas Entrance											
Cross	Long Pass	Short Pass	Combination Play	Individual Action	Free kick	Corner	Throw-In	Goal Kick	Penalty	Direct Shot Open Play	Other

4. Number of completed Passes in the Penalty Area			
None	One	Two	Three or More

4. Outcome							
Goal	No Goal	Give Away	Take Away	Foul For	Foul Against	Possession Maintained	Other

5. Reason for Outcome												
Tackle	Interception	Poor Pass	Poor Control	GK Save	GK Interception	Shot Off Target	Blocked Shot	Shot On Target	Weak Defence	Foul	Completed Pass	Other

Figure 12. *An overview of the category set.*

Level 1: Area of Final Action into the Penalty Area (point of origin of the ball)

The area of final action into the penalty area refers to the area of the field from which the ball was last contacted before it entered the penalty area. In order for this information to be specific, the whole field was divided into 16 virtual areas as identified in Figure 13.

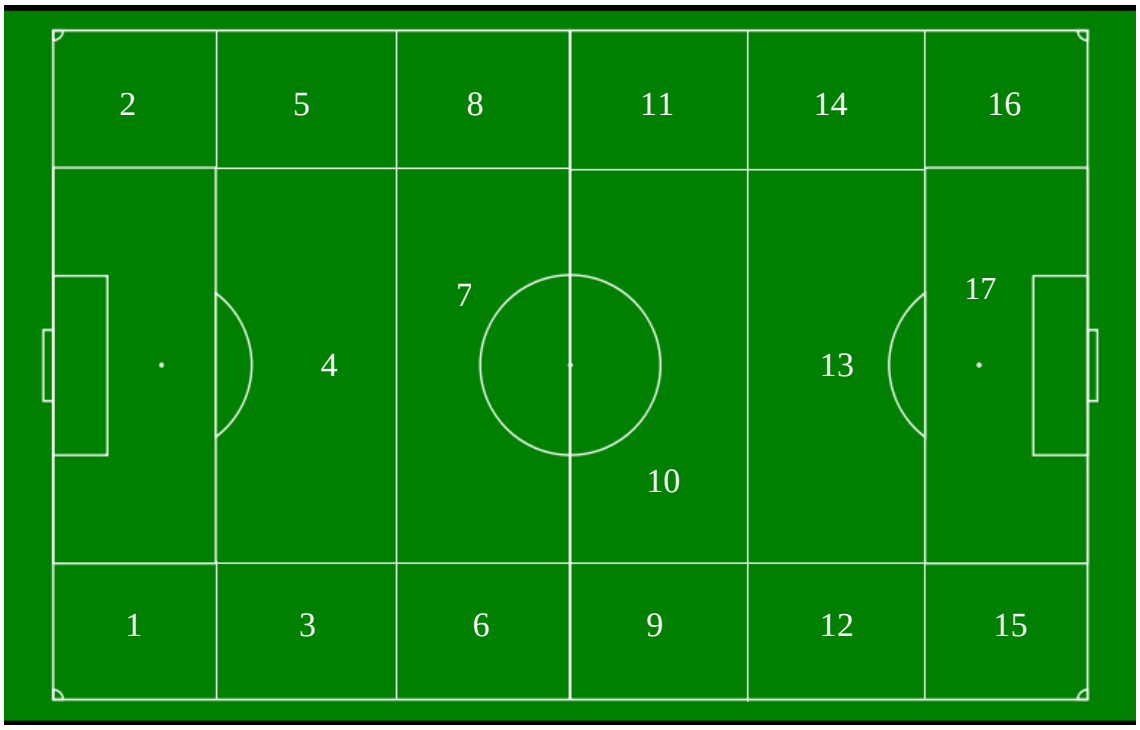


Figure 13. *Areas of final action into the penalty area.*

Area 1: The area to the left and outside of the opponent's penalty area, extending up along the touchline and goal to the end of the 18-yard penalty area.

Area 2: The area to the right and outside of the opponent's penalty area, extending up along the touchline and goal to the end of the 18-yard penalty area.

***Area 3*:** The zone next to Area 1, extending to the halfway point between the penalty area and the halfway line, with it's width up to and in line with the side of the penalty area.

Area 4: The zone extends the width of the penalty area, up to the halfway point between the penalty area and the halfway line.

Area 5: The zone next to Area 2, extending to the halfway point between the penalty area and the halfway line, with it's width up to and in line with the side of the penalty area.

Area 6: The zone is next to Area 3, and extends the width up to and in line with the penalty area, and the length from the halfway point between the halfway line and the penalty area, towards the halfway line.

Area 7: The zone extends the width of the penalty area, from the halfway point between the penalty area and halfway line towards the halfway line.

Area 8: The zone is next to Area 5, and extends the width of the penalty area, and the length from the halfway point between the halfway line and the penalty area, towards the halfway line.

Area 9: The zone is next to Area 6 and is the teams own half. It is the width of the area to the side of the penalty area up to the touchline, with its length extending from the halfway point between the penalty area and the halfway line, towards the halfway line.

Area 10: The zone extends the width of the penalty area, and its length extending from the halfway point in their own half between the penalty area and the halfway line towards the halfway line.

Area 11: The zone is next to Area 6 and is in the teams own half. It is the width of the area to the side of the penalty area up to the touchline, with its length extending from the halfway point between the penalty area and the halfway line towards the halfway line.

Area 12: The zone is next to Area 9 and is in the teams own half. It is the width of the area to the side of the penalty area up to the touch line, with its length extending from the half point between the penalty area and the halfway line, towards the penalty area.

Area 13: The zone extends the width of the penalty area, with its length extending from the halfway point between the penalty area and the halfway line towards the penalty area.

Area 14: The zone is next to Area 11 and is in the teams own half. It is the width of the area to the side of the penalty area up to the touch line, with its length extending from the half point between the penalty area and the halfway line, towards the penalty area.

Area 15: The area to the left and outside of the teams own penalty area, extending up along the touchline and goal to the end of the 18yard penalty area.

Area 16: The area to the right and outside of the teams own penalty area, extending up along the touchline and goal to the end of the 18yard penalty area.

Area 17: The penalty area of the team

Other: This includes other areas not mentioned above; such as the opponent's penalty area in the case of a penalty or free kick.

Level 2: Area of Penalty Area Entrance

The area of entrance refers to the initial area of the penalty area into which the ball enters. The penalty area was divided into 4 areas, the right and left sides, and the right front and left front areas (see Figure 14).

Right Side: It refers to the entrance of the ball into the penalty area from the right side of the penalty area.

Left Side: It refers to the entrance of the ball into the penalty area from the left side of the penalty area.

Right Front: It refers to the entrance of the ball into the penalty area from the front. The ball enters the right front area from the centre of the penalty area to the right hand corner of the penalty area.

Left Front: It refers to the entrance of the ball into the penalty area from the front. The ball enters the left front area from the centre of the penalty area to the left hand corner of the penalty area.

Other: An entrance into the area from and not mentioned above, such as in the case of a penalty kick.

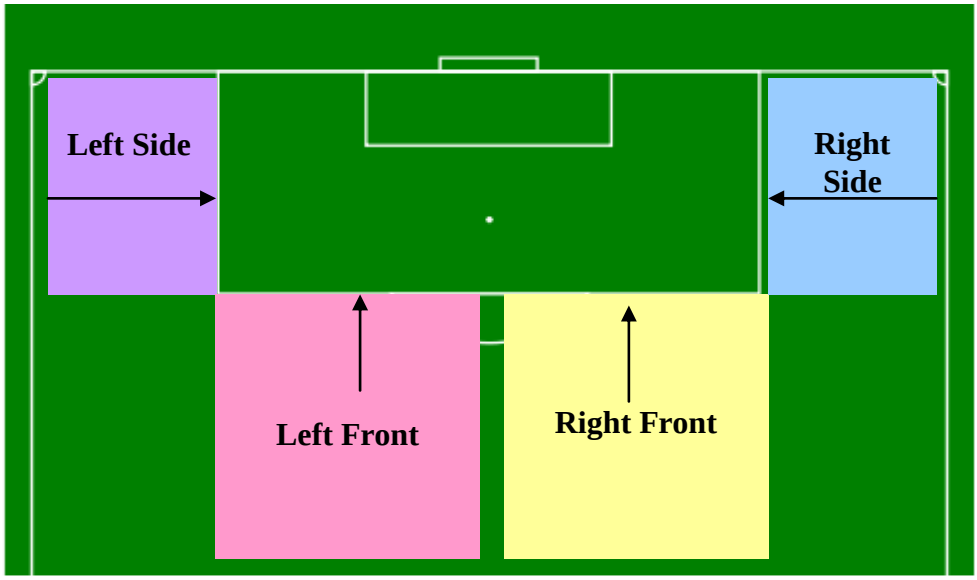


Figure 14. *Areas of penalty area entrance.*

Level 3: Method of Penalty Area Entrance

The method of entrance refers to how the ball entered into the penalty area. There were 12 categories identified at this level.

Cross from the Side*:* The ball enters the penalty area from a pass from Area 1 or 2. It includes a pass on the ground or in the air.

Short Pass: The ball enters the penalty area from a pass that is played from Area 3, 4 or 5 into the penalty area. It includes a pass with the foot, head or other body legal body part.

Long Pass: The ball enters the penalty area from a pass that crosses two or more divided areas before entering the penalty area. This includes passes into the area from all areas further away from attacking goal than Areas 3, 4 and 5.

Combination Play: The ball enters the penalty area from quick combination passes taking place between two players in Area 3, 4 or 5.

Individual Action: The ball enters the penalty area by an individual player who is the ball carrier. This action involves the player dribbling the ball into the penalty area.

Free Kick: The ball enters the penalty area directly from a direct or indirect free-kick.

Corner: The ball enters the penalty area directly from the corner set piece**.**

Throw-in: The ball enters the penalty area directly from a throw-in.

Goal Kick: The ball enters the penalty area directly from a goal kick.

Direct Shot from Open Play: The ball enters the penalty area from a shot at goal during open play from outside the opponent's penalty area (anywhere on the field).

Other: The ball enters the penalty area as the result of any other legal method.

Level 4: Number of Completed Passes in the Penalty Area

The number of passes in the penalty area refers to the number of completed passes that took place between the attacking team players within the penalty area. There were four categories identified at this level.

None: There were no passes completed between the attacking team players whilst in the penalty area.

One: One pass was completed between the attacking team players while in the penalty area.

Two: Two passes were completed between the attacking team players while in the penalty area.

Three or More*:* Three or more passes were completed between the attacking team players while in the penalty area.

Level 5: Result of Penalty Area Entrance

The result specifies the outcome of the penalty area entrance. There were four categories identified at the level.

Goal: Ball successfully enters the goal.

No Goal: A shot at goal is taken but does not result in a goal.

Give Away: Loss of possession due to a poor play by the attacking team.

Take Away: Loss of possession due to a well-executed play by the defending team.

Foul For: A foul is awarded against the opposition in the penalty area for an infringement of the law. This will result in either a penalty kick or indirect free kick.

Foul Against: A foul is awarded against the attacking team in the penalty area for an infringement of the laws.

Possession Maintained: The ball enters and leaves the penalty area in the possession of the attacking team.

Other: Created in case of the occurrence of any result that is not accounted for above

Level 6: Reason for the Outcome

The result specifies the outcome of the penalty area entrance. There are 12 categories in this level.

Tackle: Ball possession taken away by the defending team due to a tackle or aerial challenge.

Interception: Ball possession taken away due to an interception by the defending team. When an interception is made, the defence of the opposition has executed the defensive action well and has been able to take the ball away from the offensive team that has executed an action relatively well.

Poor Pass: Loss of possession due to a poor pass that did not find the target. When a poor pass is made, the offence has not executed the pass well, making it relatively easy for the defensive team to gain possession of the ball.

Poor Control: Loss of possession due to poor ball control by the ball carrier.

Goalkeeper Save: A shot at goal that is saved by the opponent's goalkeeper.

Goalkeeper Interception: The interception of a pass into the penalty area by defending goalkeeper.

Shot Off-target: A shot at goal by the attacking team that is off target and misses the goal.

Shot On-target: A shot at goal by the attacking team that is on target and results in a goal.

Weak Defence: General lack of positive actions by the defence to prevent a goal being scored.

Blocked Shot: A shot at goal that enters the penalty area and is directed toward the goal but is blocked off target by the defenders (other than the goalkeeper).

Foul: A direct or indirect free kick awarded to the attacking team within the opponent's penalty area, due to an infringement of the laws by the defenders. Or a direct or indirect free kick awarded to the defending team within the penalty area, due to an infringement of the laws by the attacking team.

Completed Pass: The means by which possession of the ball is maintained, as the ball is successfully passed from within the penalty area to a team mate outside of the penalty area

Other: Any reason not identified in the categories above.

Validity of the Content of the Category Set

Content validity is claimed when an assessment method or instrument is considered by experts to be an accurate approach to assessing the performance being measured (Thomas & Nelson, 2001). Validating the category set developed for this study was achieved through gaining the endorsement of two football coaches/experts and their acceptance of the category set as a reasonable and productive way to analyse penalty area entrances in professional soccer. The following steps were taken to establish the content validity of the category set.

- The two experts were invited based on the roles that they play with the Football Club and the Department of Sport Science at Stellenbosch University. Both

experts accepted after receiving a description of the validation process. Both experts had an extensive knowledge of the game and both played and coached at the advanced level. Their insight into the game and the reasons for successful and unsuccessful events was considered to be ideal for the validation process

- The validation process took place over three sessions (one session each day) to ensure the effectiveness of the process. During the first session, the investigator explained the purpose of the research and then presented the full category set to the experts. Time was allowed for the experts to acquaint themselves with the category set and to ask questions of the examiner regarding the set itself as well as criteria for categorising actions during analysis of matches.

- During the second session, the experts were allowed to "play" with the category set by applying it to a game in a mock performance analysis session. This session was provided to allow them to experience personally how it felt to try to apply the category set to the analysis of penalty area entrances.

- During the third session, an independent investigator with experience in performance analysis research conducted a formal session to establish the validity of the category set. The experts agreed to follow the format of what is called "consensual analysis" in which the experts may discuss together how they would rate each level in the category set in terms of its appropriateness for the purpose of this study. Because both experts had used performance analysis technology on many other occasions, they were accustomed to shaping category sets to the purpose for an analysis. Following a thorough discussion of the category set, they were asked to arrive at a single rating of its 'fitness for purpose' on a scale of 1 – 10. They agreed to rate the category set at least as a 9, feeling that there would always be some difficulty in determining if the offense has lost the ball in the penalty area (their error) or if the defense had taken the ball away (defensive skill). They also agreed this would always be an opportunity for differences of opinion.

Reliability of the Application of the Category Set

Reliability in the performance analysis process is of crucial importance. If a measurement instrument cannot yield the same results upon successive trials, then the data

and its subsequent analysis cannot be trusted (Thomas & Nelson, 2001). For the purpose of this study, reliability was defined as the consistency with which the investigator analysed games. It was determined by the repeatability of the analysis, determined through the re-analysis of two games. Reliability was established by comparing the results generated for the analysis of identical video footage from two games, randomly drawn from the collection of games.

After completing the initial performance analysis of a game, a re-analysis was completed three days later. A comparison was then made between the results from the first and second analysis. The purpose of this comparison was to identify differences between the first and second analysis on all respective levels of analysis of the category set. The same sequence of events was followed for a second game, also drawn at random from the collection. The purpose of this comparison was to identify differences between the first and the second analysis in terms of the area of final action into the penalty area, area of penalty area entrance, method of entrance, number of completed passes in the penalty area, result of the entrance and the reason for the outcome. The goal was to achieve a minimum agreement rate of 80% between the first and second analysis. The results of the reliability process are presented in Table 8.

Table 8.

Reliability as percentage of agreement for each level in the category set.

Level in the Category Set	**Match 1**	**Match 2**
Area of final action	92.9%	90.7%
Area of penalty area entrance	96.4%	95.3%
Method of entrance	100.0%	86.0%
Number of completed passes in the penalty area	100.0%	100.0%
Outcome of penalty area entrance	95.3%	96.4%
Reason for the area of the penalty area entrance	90.7%	91.1%
Total Rate of Agreement	**95.9%**	**93.3%**

Performance Analysis using the Category Set

One of the coding functions of the Soccerstat software allows for penalty area entrances and shots at goal coded by the researcher to be recalled as individual video clips after the match. The video clips coded for penalty area entrances and shots at goal were identified and analysed further using the category set in the following sequence:

1. Set up the Sony VAIO computer and connect it to the external hard drive.
2. Sort the penalty area entrances and shots at goal clips from the Soccerstat software onto the external hard drive.
3. Observe video clip two to three times in order to ensure accuracy of decisions made.
4. Once a decision has been made on the respective levels of analysis, record it in the correct cell on the Excel spreadsheet.
5. To complete the analysis, perform the calculations needed and generate a report of the results.

A penalty area entrance constituted the entrance of the ball into the penalty area based on the premise that in order for a goal to be scored the ball has to enter the penalty area first. Each penalty area entrance ended once the ball left the penalty area, or was out of play. The focus of the analysis was on the end result of the penalty area entrance, rather than analysing everything that occurred in the area, and therefore only one parameter in each level of analysis was selected per penalty area entrance.

Data Analysis

Microsoft Excel applications were used to analyse the data. Frequencies were calculated for each sublevel of the category set. From the frequency data, percentages were calculated to determine the percentage frequency of each event within there respective level of analysis. The mean, mode and median were calculated to give an indication of central tendencies. Standard deviation was calculated to measure the degree of variability.

Chapter Four

Results and Discussion

Following a general overview of attacking play as analysed over 10 home matches, data are presented to answer each of the research questions. Links to previous research related to the research questions are also presented to put the performance of the team in this study into the context of professional football.

General Overview

Over the course of 10 home matches, the team in this study won six (60%) drew three (30%) and lost 1 (10%). A total of 70% of the points scored were in favour of the home team. This finding is slightly higher than the seasonal 66% average found by Carling *et al.* (2005) in the English Premiership, and the 62.8%, 57.4% and 62% found in the 2000-2001, 2001-2002 and 2002-2003 seasons respectively in the English Premiership (Pollard & Pollard, 2005). The team's home win record was better than those found in the 2006-2007 and 2007-2008 seasons of the Greek top league in which the home team won 51.9%, lost 24.7% and drew 23.4%. From the comparisons, it would appear that the team in this study performed well at their home ground (a home ground advantage). However, it is important to remember that the sample consisted of only 10 home matches and not a full season. Table 9 provides an overview of the penalty area entrances and goal attempts for the 10 matches.

Table 9.

Overview of penalty area entrances

Results over 10 Matches	Goals For	Goals Against	Total Penalty Area Entrances	Total Shots	Box Entries/ Goals	Box Entries/ Shots	Shot/ Goals
Total	19.0	5.0	594.0	143.0	-	-	-
Mean	1.9	0.5	59.4	14.3	37.4	4.4	9.3
SD	1.5	0.7	10.5	4.3	22.4	1.3	5.8
Median	1.3	0.0	57.0	13.5	26.5	4.2	9.0

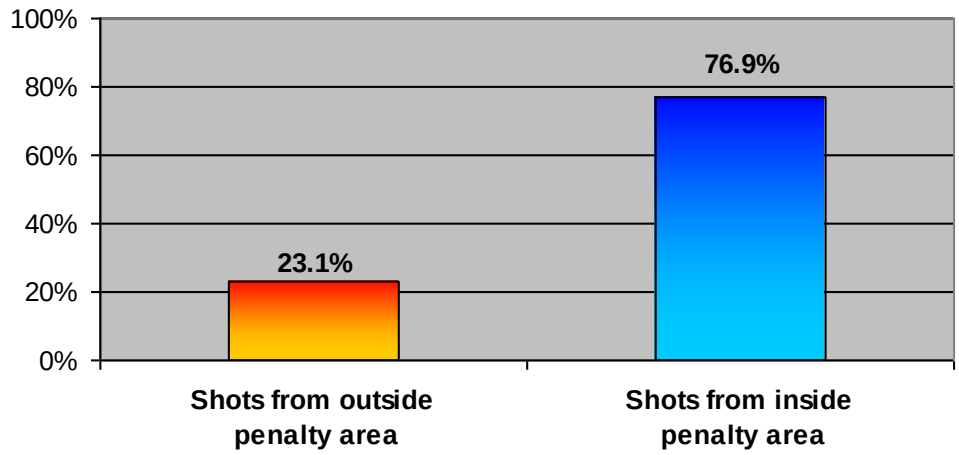
The team scored a total of 19 goals (1.9 goals average per game), which is slightly lower than the average number of goals per game of the English Premiership League Champions (2.04 per game) recorded since the inception of the league in 1992 until 2009 (Premier League, 2009). The 1.9 average goals per game is higher than the average goals per game of the PSL Champions (1.58 per game) since the inception of the league in 1996 until 2009 (PSL, 2009).

In terms of the number of goals scored against them, the team conceded 5 goals in 10 matches, which is a lower average (0.5 goals per game) than either the 0.84 average for English Premiership League Champions (Premier League, 2009) or the 0.75 average for the PSL Champions (PSL, 2009). These results support the conclusion that the team had a good goal scoring record and were strong defensively in terms of the goals they conceded.

The team entered into their opponents' penalty area 594 times over the 10 matches (average of 59.4 entrances per match). It took an average of 37.4 entries into the penalty area to score a single goal, although a shot at goal was taken on an average of every 4.4 entries into the penalty area. In total there were 143 shots taken at goal by the team (14.3 shots on average per game). Compared to the results of finalists and unsuccessful teams in the 2002 World Cup , the team took an equal number of shots per game as those teams termed unsuccessful (14.08 shots per game) and fewer than the 18 shots per game taken by the top teams in that competition (Szwarc, 2002). The team entered the penalty area many times during the matches, (approximately one entry every 1 ½ minutes) and one would expect that entering the penalty area this frequently would result in more goals than they managed to successfully convert. It is therefore recommended that the team become more efficient and effective in their attacking play.

A total of 76.9% of all shots were taken from inside the penalty area and 23.1% from outside the penalty area (see Figure 15). This gives an indication that the team was successful in penetrating the opponents defence. This is a greater percentage of total shots from within the penalty area than taken by the top teams (50.4% of total shots) and last placed teams (38.9% of total shots) in the Greek League (Armatas *et al.*, 2009b). The team scored 94.7% (18 goals) of their goals from shots taken within the penalty area and 5.3% (1 goal) from a shot taken from outside the penalty area (direct shot from free kick). This is slightly higher than the majority of previous studies that have reported that 80-90% of all

goals were scored from within the penalty area (Yiannakos & Armatas, 2006; Carling *et al*., 2005; Njorojai, 2004; Hughes *et al.* 1988; Olsen, 1988), but is similar to the results of Hewer and James (2004), who found that 95% of goals were scored from within the penalty area when English Premiership teams played against each other. Armatas *et al*. (2009a) speculated that teams that are able to take more shots from within the penalty area have a greater technical and tactical ability to get into those positions; whereas teams that take more shots from outside the area, have difficulty penetrating the opponents defence in



order to enter the danger area to take a shot at goal (Brown & Hughes, 2003).

Figure 15. *Distribution of shots taken from inside vs. outside the penalty area.*

Another possible reason for the team taking the majority of their shots from within the penalty area, could be as a result of the opponents defending from further up the field which created space behind the defence in which to play, and ultimately allowing them to enter the penalty area, rather than forcing the team to take shots in front of the defence before they reach the penalty area, such as with teams that defend deep in their own defensive third (Hewer & James, 2004). Since this is frequency data, the result could also be as a result of goals being scored from set pieces that are played into the penalty area for teammates to score. These options for explaining this data illustrate the need to pursue performance analysis to the level of detail where some specific insight is gained into what is happening and why.

It took the team on average 9.3 shots to score one goal. This is higher than the 7:1 shot-to-goal ratio of successful teams (semi-finalists) in the 2002 World Cup and lower than the 11:1 shots-to-goal ratio for successful teams at the 2006 World Cup (Walker *et al.*, 2006). It is interesting to note that teams defined as unsuccessful at the 2006 World Cup had a ratio of 22:1 (Walker et *al.,* 2006) and the top ranked teams at the 2004 European Championships had a ratio of 8.4:1 (Hughes & Snook, 2004). The team took slightly more shots to score a goal than the Greek first (7.5:1 ratio) and second placed teams (8.1:1 ratio), but fewer shots than the last (13.7:1 ratio) and second last teams (14.7:1 ratio) in the Greek top level soccer league in the 2008-2009 league season (Armatas *et al*., 2009b). Looking at these international results, it does appear as if the studied team is on par with international standards, and can be ranked together with a shot to goal ratio of the top level teams. A possible reason for the team not achieving results such as that of Brazil (5:1 shot to goal) at the 2002 World Cup and France (7:1 shots to goal) at the 1998 World Cup and 2000 European Championships, could be as a result of a failure to create good quality scoring opportunities, as opposed to poor shooting ability (Ensum *et al*., 2005). It does appear that more successful teams have a lower shot-to-goal ratio, however, teams do approach tournaments in different ways from their approach to league matches, so comparisons between past research and the performance of the team in this study may not be optimal.

A general look at shooting accuracy revealed that 48.9% of the shots taken were off-target, 43.4% were on-target and 7.7% were blocked by the defensive team (see Figure 16).

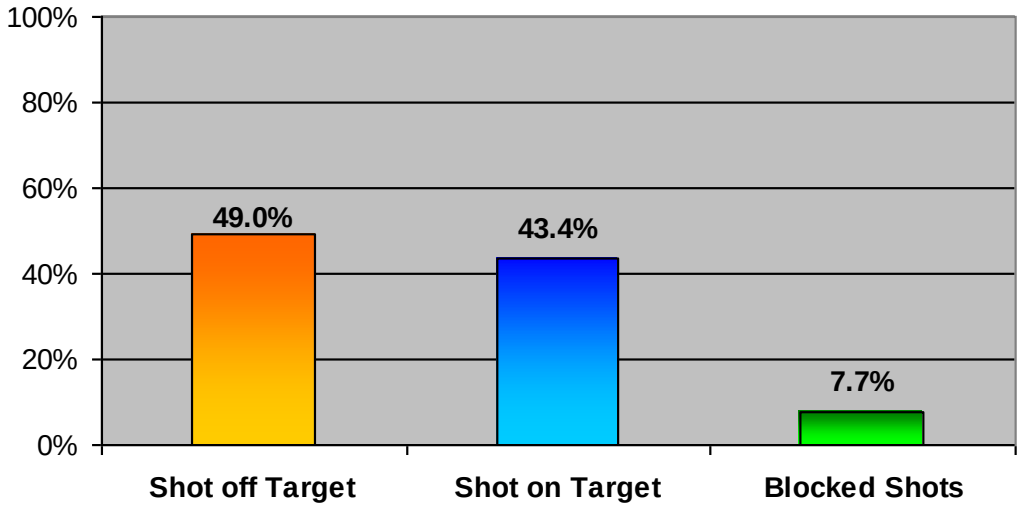


Figure 16. *Results of shots at goal.*

Research Question One

1. From which area of the field is the final action of play before the ball enters the penalty area and which part of the penalty area does the ball enter when attacking play is successful and unsuccessful?

The most common area of final action of play before the ball entered the penalty area was from Area 4 (25.6% of all entries), which is the area in front of and directly bordering on the penalty area (see Figure 17). This could be in an attempt to enter Zone14 (the central area just outside the penalty area) as Horn *et al.* (2002) suggested. They found that 86% of passes into this area would subsequently enter the penalty area and thus be likely to provide shooting opportunities. Of the penalty area entrances from Area 4, a total of 4 goals were scored which was 21.1% of all goals (see Figure 18). This pattern indicated that the team attacked the penalty area most often through the central channels of the field.

The next most popular area of entrance was Area 1 (20.2% of all entries) from which 2 goals (10.5% of all goals) were scored. Third most frequent area was Area 2 (16.7% of all entries) from which 7 goals were scored (36.8% of all goals). Even though they entered the penalty area more often from the left side as compared to the right, they were more successful in converting these entrances from the right side into goals. The majority of the goals were scored from attacking play from within the attacking third of the field (16), with three goals being scored by passes from the midfield third. No goals were scored from passes from the defensive third of the field. When Areas 1 and 2 (wide corner areas) are combined they make up the greatest frequency of penalty area entrances, and this indicates that the team spent a large percentage of their attacks in the wide areas of the field, and that they attacked from the wide areas of the field most frequently as compared to the central areas of the field.

Attacking from wide areas of the field appears to be the attacking team's main strategy. It is however important to remember that more set pieces take place in Areas 1 and 2 combined than in Area 4 due to throw-ins and corners. It is important that this is kept in mind when interpreting the data.

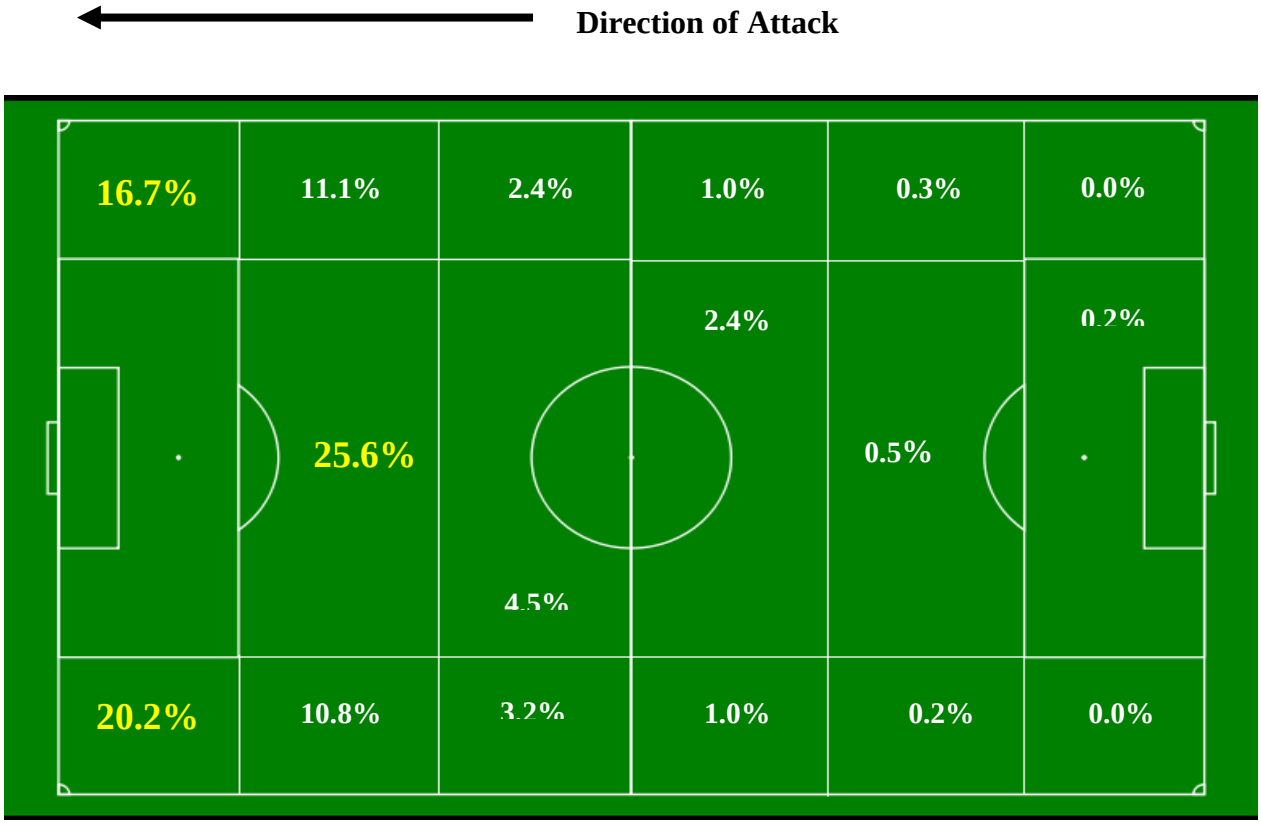


Figure 17. *Areas from which final actions were initiated for ball entry into penalty area.*

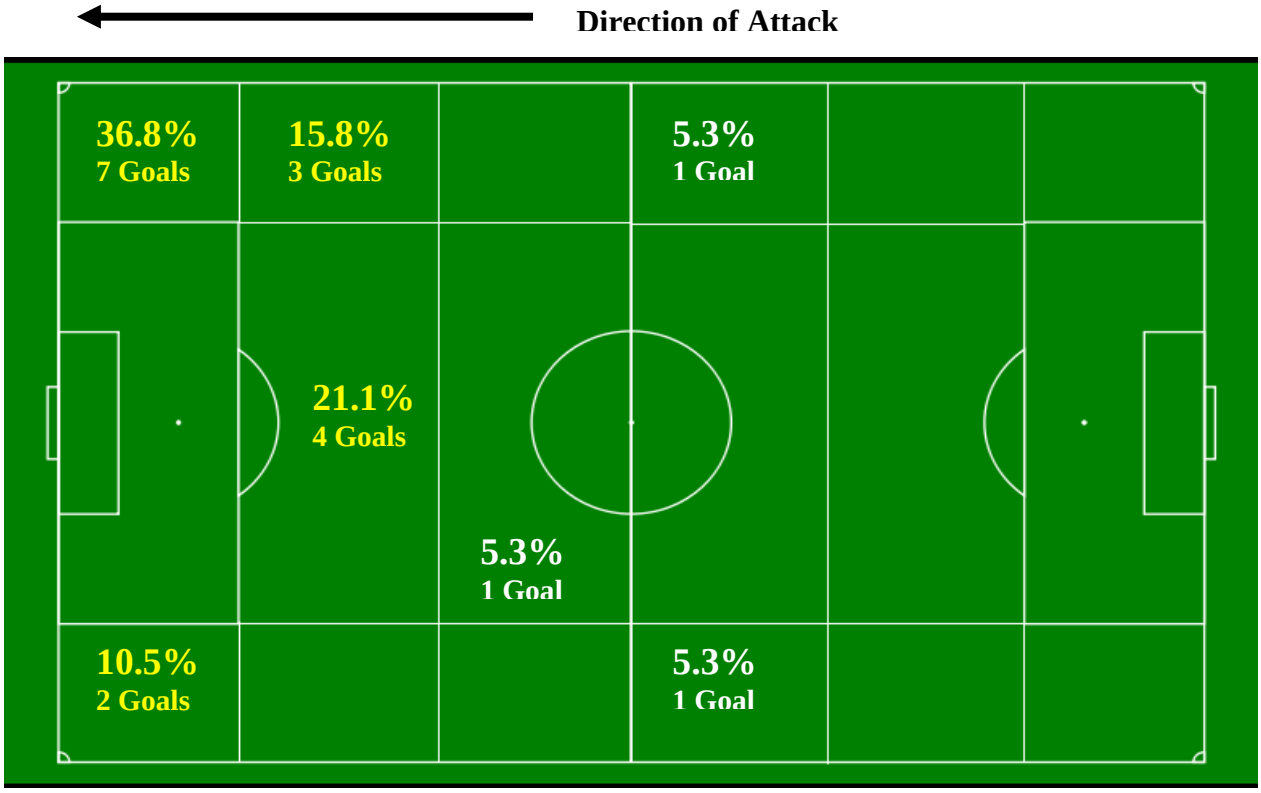


Figure 18. *Areas from which final actions were initiated that led to goals.*

A general summary of area of attacking play leading to penalty area entrances is presented in Figure 19. The following patterns were noted:

- When attacking from the central areas of the field, the team displayed a balance in their entrances from the left (27.1%) and from the right (27.4%) areas of the penalty area. From the entries on the left, the team scored three goals (15.8% of all goals) and six goals (31.6% of all goals) were scored from entries on the right.

- From the sides of the penalty area, the team attacked most often from the left side (24.9%) of the penalty area when compared to the right side (20.5%). Of the entries from the left and right sides of the penalty area, the team scored two goals from the left (10.5% of all goals) and eight goals (42.1% of all goals) from the right.

The team had a slightly greater frequency of entries in the penalty area from the left side (left side and left front) than from the right side (right side and right front) but were more successful in scoring goals when entering the penalty area from the right (14 goals) than the left (5 goals). This could be as a result of more skilful wingers of the right side of the field who as Wiemeyer (2003) described, are the players who most often have the task of beating opponents and delivering quality balls into the penalty area for attempts at goal.

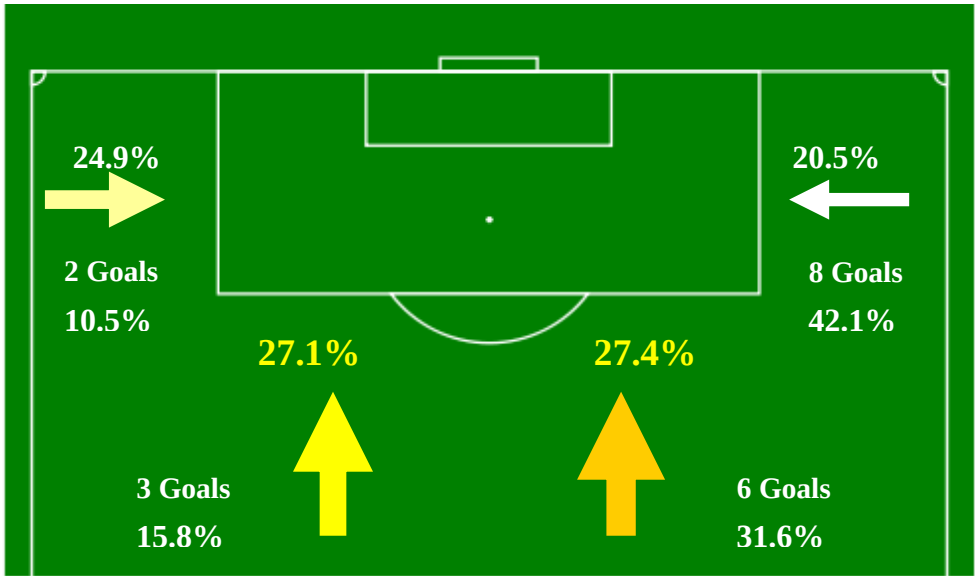


Figure 19. *General areas of entrance into the penalty area and goals scored.*

This higher success rate for the right side could also be a product of the majority of players being right foot dominant, making it easier to set themselves up for shots at goal from the right side of the field. This rationale was put forward by Hook and Hughes (2001) who found in the 2000 European Championships that the majority of shots were taken with the right foot. Four of the five goals scored from corners were scored from the right side, which means that a large number of the entries from the left and right side of the penalty area were from set pieces and not open play (goals scored from set pieces will be discussed in more detail later). The higher number of goals from the right side could also be due to a corner/set piece expert from the right side who is able to place the ball consistently into the danger areas for teammates to score.

Although the goals were scored predominantly from the right side, the team in this study entered the penalty area with a relatively balanced approach between the central (54.5%) and wide areas (45.5%) of the field, indicating that they varied their point of attack, and as Lucchesi (2001) advocated, adopted an unpredictable method of attack.

Research Question Two

2. How does the ball enter the penalty area on successful vs. unsuccessful attacking plays?

The method of penalty area entrance can be divided into open play entries (short pass, cross, long pass, combination play, individual action, direct shot open play and the other category) and entries from set pieces (free kick, corner, throw-in, goal kick and penalty) (see Figure 20). Entries from open play made up 65.5% of the total entries and set-plays made up 34.5%, which highlights that the majority of entries were as a result of entries from open play. The most frequent method of penalty area entrance was from a short pass (24.1%) followed by a cross (13.3%), free kick (12.6%), long pass (12.3%), corner (11.1%), throw-in (10.8%), individual action (8.6%), direct shot (5.6%), other (0.8%) and combination play (0.8%). There were no entries into the penalty area from goal kicks or penalties. The higher number of short passes and crosses that resulted in penalty area entrances gives an indication that the team played a more possession style of football as opposed to the long ball game with is based on the quantity of entries into the penalty area rather than the quality of these entries (James, 2006).

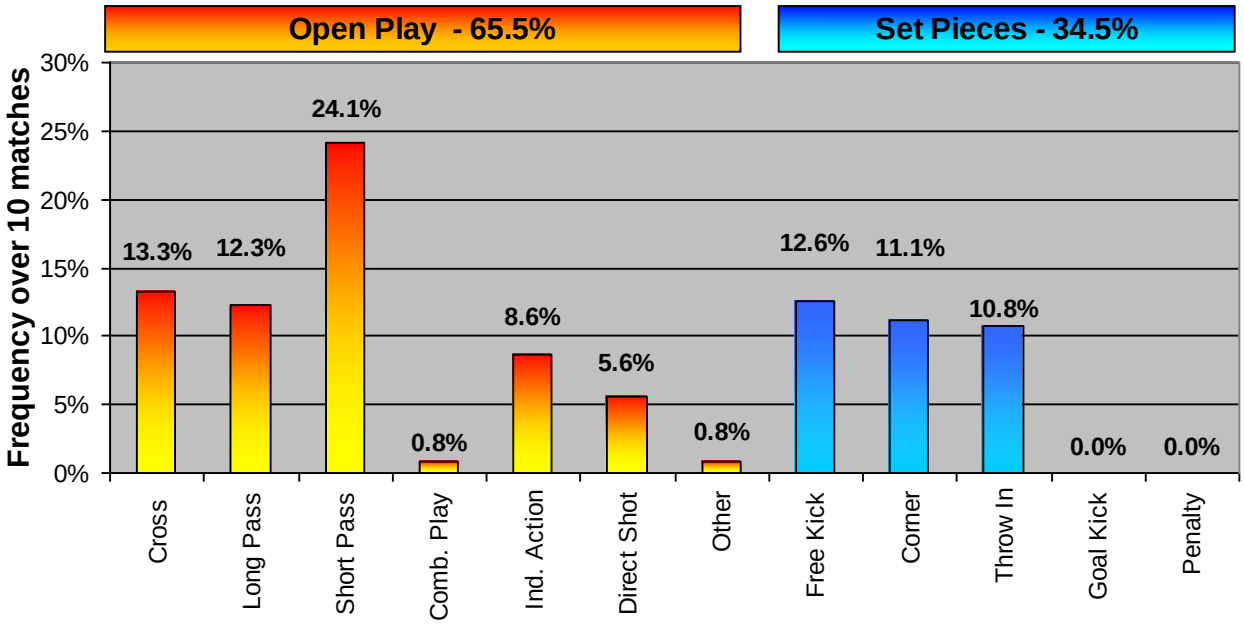


Figure 20. *An overview of the methods of entrance into the penalty area.*

Figure 21 presents a breakdown of the method of entrance from open play. These methods were short passes (36.8%), crosses (20.3%), long passes (18.8%), individual action (13.1%), direct shot (8.5%), other (1.3%) and combination play (1.3%). The high percentage of entries into the penalty area from short passes, crosses and individual actions indicate that the attacking team most often entered the attacking third of the field before playing the final pass into the penalty area.

Figure 22 presents a breakdown of methods of entrance from set pieces. These methods were free-kicks (36.6%), corners (32.2%) and throw-ins (31.2%). As mentioned earlier, there were no penalty area entrances as a result of goal kicks or penalties.

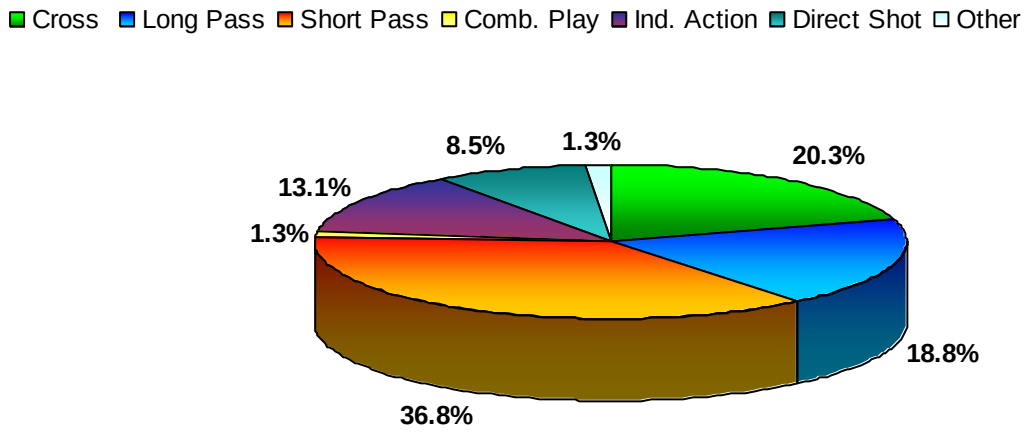


Figure 21. *Methods of entrance from open play.*

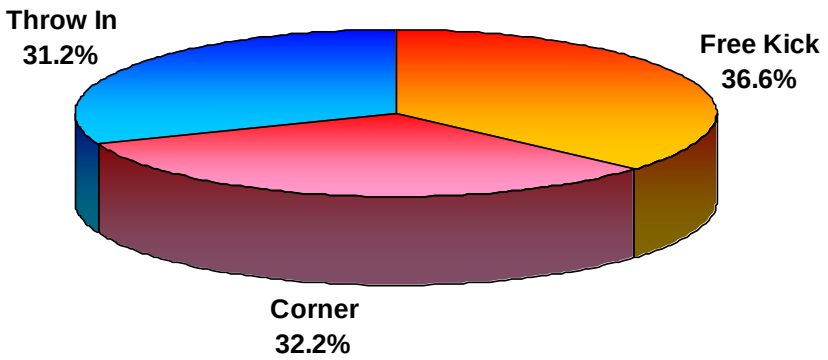


Figure 22. *Methods of entrance from set pieces.*

Goals scored from open play and set pieces made up 57.9% and 42.1% of goals respectively (see Figure 23). The percentage of goals scored from set pieces were higher for this team than in other studies that have reported that up to one third of all goals were scored from set pieces (Yiannakos & Armatas, 2006; Njororai, 2004; Bangsbo & Pietersen, 2000).

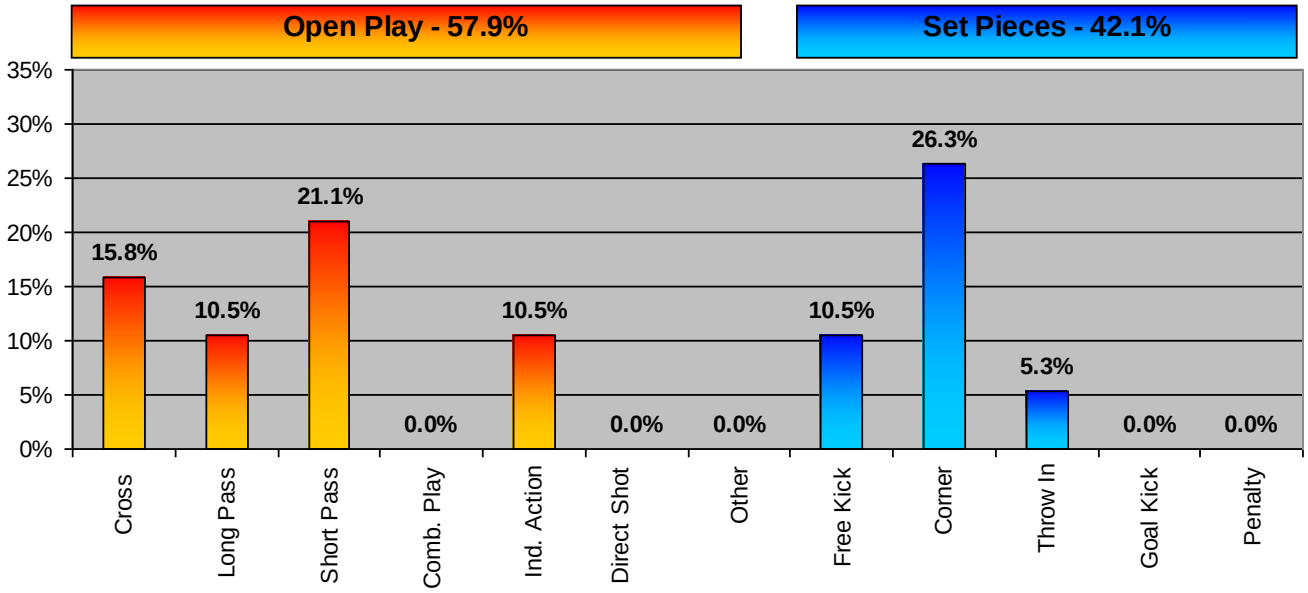


Figure 23. *An overview of methods of entrance into the penalty area resulting in a goal.*

Overall the majority of goals were scored as a result of entries into the penalty area from corners (26.3% - 5 goals), followed by short passes (21.1% - 4 goals), crosses (15.8% - 3 goals), long passes (10.5% - 2 goals), individual action (10.5% - 2 goals), free kicks (10.5% - 2 goals) and throw-ins (5.3% - 1 goal).

The fact that the attacking team scored greater than a third of their goals from set pieces indicates that the team was effective in converting their set pieces into goals, especially from corners. This could be as a result of set piece experts who could place the ball in the dangerous areas of the penalty area in order for goals to be scored, and strikers who were skilful in beating their opponents to the ball and converting chances into goals, especially from aerial balls played into the penalty area (*i.e.* corners and free kicks).

Figure 24 presents a breakdown of the methods of entrance when goals were scored from open play. Short passes made up 36.4% (4 goals) of the goals scored, followed by crosses at 27.3% (3 goals), long passes and individual action at 18.2% (2 goals each). Although the exact definitions of the variables may be different, Yiannakos and Armatas (2006) found that more goals were scored from long passes (34.1%), combination play (29.3%), individual action (17.1%) and direct shots (14.6%) in the 2004 European Championships. These results are in contrast to this study in which fewer goals were scored from long passes, no goals were scored as a result of combination play and direct shots, although a similar percentage of goals were scored from individual actions.

In the present study no goals were scored from the ball carrier taking a shot at goal from outside the penalty area (direct shot at goal). Referring back to Figure 15, only 23.1% of the shots at goal were taken from outside the penalty area (3.3 shots per game). Figure 21 reveals that 8.5% of penalty area entrances were as a result of direct shots from open play. This indicates that the team did attempt shots at goal from outside the penalty area, but were not successful in converting these shots into goals. This could be as a result of poor technical ability (the shots at goal were either off-target or easily saved by the keeper) or it could be a reflection of the defensive patterns of the opponents. Hewer and James (2004) found that when opponents defended from further back in their defensive area it created more space for the attackers to run at the defence and set-up for a shot, increasing the space and time to take a shot at goal. It could be that the opponents of the team in this study defended from further up the field rather than closer to their own goal resulting in less space and time for the attackers to set up for a shot at goal and when they did, they were placed under great pressure.

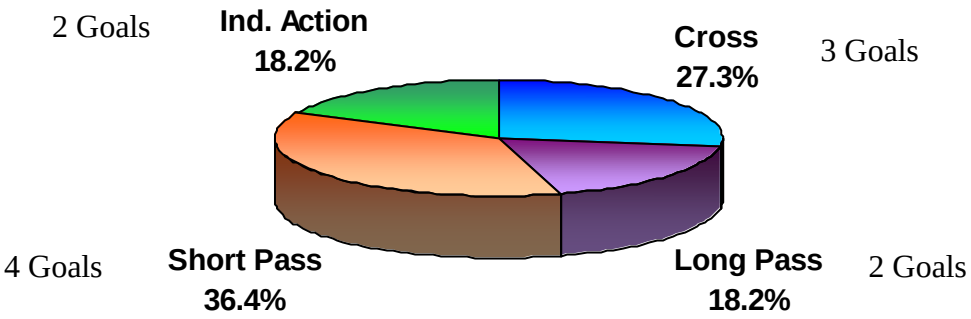


Figure 24. *Methods of entrance when goals were scored from open play.*

The fact that combination plays made up only 1.3% of penalty area entrances and did not result in any goals gives an indication that either combinations were not a popular tactic or that the team in this study was not able to successfully execute combination plays. Combination plays most frequently take place as a result of a midfield player passing to a player in a more advanced position (*i.e.* striker) and then receiving the ball back from a pass that is played into space. The link between the midfield and strikers in this study may not have been as effective as it was for the teams in the study by Yiannakos and Armatas (2006). The proportions of goals scored from crosses are similar to that found in the 2002 World Cup, in which 29% of all goals were scored from crosses (Carling *et al*., 2005).

In Figure 25, it can be seen that the majority of entries from set plays were as a result of free kicks (37%), followed by corners (32%) and throw-ins (31%). There were no entries from goal kicks or penalty kicks. On average per match, there were 7.5 free kicks, 6.6 corners and 6.4 throw-ins that resulted in penalty area entrances. Of the 8 goals scored from set pieces, 5 goals were scored from corners (62.5%) 2 from free kicks (25.0%) and 1 from throw-ins (12.5%).

- When compared to the results of the European Championships in 2004 (Yiannakos & Armatas, 2006) a greater percentage of goals were scored in the present study from corners (62.5% vs. 40%) and throw-ins (12.5% vs. 5%) and slightly fewer were scored from free kicks (30% vs. 35%).

- In the 1998 World Cup, a lower percentage of goals were scored from free kicks (50% vs. 25%), however, a greater percentage was scored from comers (62.5% vs. 47.6%) (Grant *et al.*, 1999).

- In the 1994 World Cup, a lower percentage of goals were scored in the present study from free kicks (42% vs. 36.6%) (Sousa & Gargantua, 1998). Of the 66 (6.6 per match) corners that entered the penalty area, 13% resulted in goals. This is a slightly better conversion rate than the 10.2% found in the English Premier League (Taylor *et al*., 2005b) and 7% found in the 2000 European Championships (Hill & Hughes, 2001)

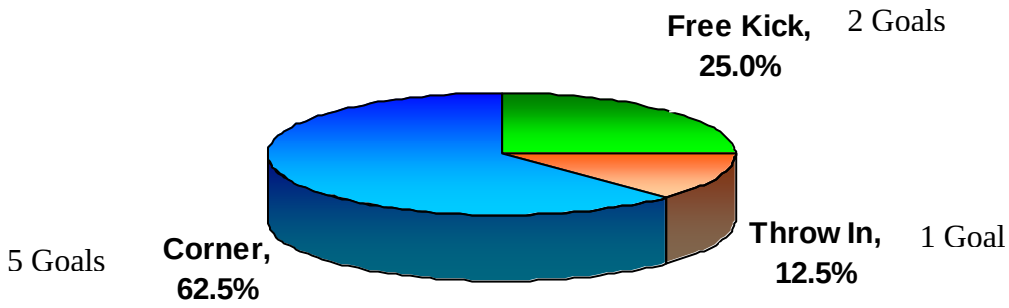


Figure 25. *Methods of entrance when goals were scored from set pieces.*

When comparing the results of this study to results of previous research, it is important to note that that research was primarily conducted on games played during tournaments. In the knock-out stages of tournament play, the game is decided by a penalty shoot-out if the match ends in a draw. It is not known how many times this situation occurred in the tournament matches, and if it did occur, it might account for the higher percentage of goals scored from penalty kicks. Overall when compared to international results, the team in this study scored more goals from corners and fewer goals from free kicks and a similar number of goals from throw-ins.

Research Question Three

3. What are the outcomes and reasons for outcomes when attacking play is successful and unsuccessful?

Before looking at the reasons for successful and unsuccessful shots at goal, a calculation was made of the number of passes completed within the penalty area after the ball had entered (see Table 10).

Table 10.

Percentage of completed passes within the penalty area.

Observation	None	One	Two	Three or more
Over 10 Matches	96.1%	3.5%	0.2%	0.0%
For 19 Goals	84.2%	10.5%	5.3%	0.0%

The majority of entries into the penalty area did not result in any completed passes. Completed passes in the penalty area were a rare occurrence only 3.5% of all entries resulting in one completed pass and 0.2% of all entries resulting in two completed passes. No entries resulted in three or more passes. The lack of passes completed in the penalty area is in an indication of the high pressure placed on offensive players once they touch the ball. Not only is the attacking team placed under immediate pressure from the defenders once they enter the area, the pressure also may be the result of limited support from teammates (giving few options for the ball carrier) or evidence of the ball carriers' inadequate technical ability in terms of finding a teammate with a pass. The majority of goals were scored from a direct strike within the penalty area (84.2% - 16 goals) of all goals. A very small percentage of goals (10.5% - 2 goals and 5.3% -1 goal) were scored from one and two completed passes in the penalty area respectively.

The majority of entries into the penalty area resulted in the ball being taken away from the attacking team by the opposition (42.3%), followed by the ball being given away (22.4%), no goal (21.0%), possession being maintained (6.1%), fouls (4.5%), goal (3.2%) and other (0.5%). In Figure 26, the reason for the outcome of each category of entrance is presented.

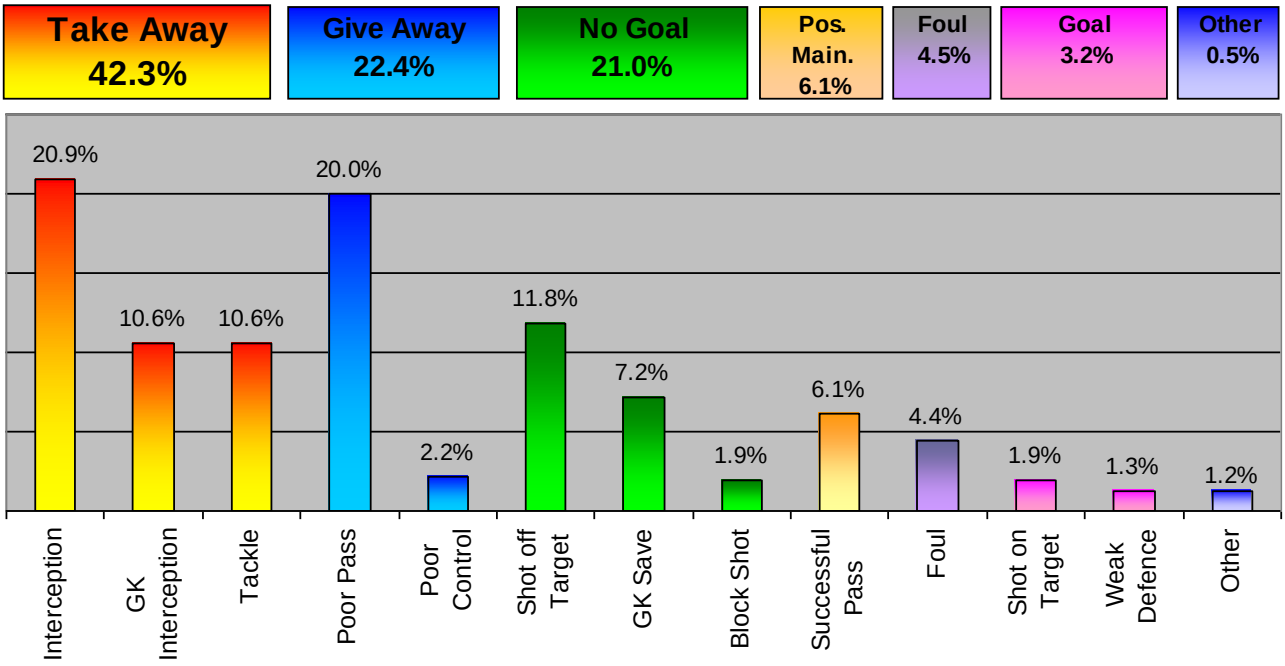


Figure 26. *The outcome and reason for outcomes of penalty area entrances.*

Ball Taken Away (42.3%)

The three possible reasons for the ball being taken away included tackles, interceptions and goalkeeper interceptions. The most common reason for the ball being taken away was as a result of an interception (49.2%) followed by goalkeeper interception (25.6%) and tackle (25.2%). This was an indication that even though the ball was taken away from the attacking team as a result of positive actions by the defenders (goalkeeper interceptions and tackles), almost half of the time it was a defensive interception made by the opponents. This calls into question their technical/tactical proficiency of passing in and around the penalty area. For example, the investigator in this study noticed that many of the passes that were attempted into and within the penalty area were played too close to the defending players and goalkeeper, which made it possible for them to cut out the passes from reaching the other offensive player. This supports the results presented earlier in which it was reported that 96.1% of all penalty area entries resulted in no passes being completed in the penalty area.

When 42.3% of the balls played in the penalty area are taken away by means of tackles and interceptions (by either defenders or goalkeepers), it is recommended that coaches examine the reasons. The investigator in this study would propose consideration of the following:

1. Poor support play by the teammates of the ball carrier, resulting in the ball carrier having to make a speculative pass to find a teammate, which was then intercepted by the opponents.

2. Teammates too slow in supporting the ball carrier or ball carrier not having enough options in the penalty area which resulted in his either being tackled or forcing a pass.

3. Poor technical execution of passing in the penalty area, inviting the defending team to cut out passes played in the area.

4. Poor decision making by the ball carrier inside the penalty area, for example, a player trying to complete a pass when they are in a position to take a shot at goal.

5. The high pressure placed on the attacking team by the defenders resulting in the attacking team having very little time or space on the ball to perform an action or make a decision.

Ball Given Away (22.4%)

The next most frequent outcome was that the ball was given away by the attacking team as a result of poor passing (20%) or poor ball control (2.2%) overall. This illustrates the unsuccessful execution of attacking play. One can argue that superior opposition can take the ball away from a team, but when the ball is given away, it suggests that the technical execution of the attacking team needs to be examined. The investigator in this study would recommend that the coaches look at the following possible reasons for this team losing the ball in the penalty area:

1. Selecting the wrong types of pass.

2. Not putting enough weight on the pass.

3. Questionable decision making – passing when they don’t need to pass.

4. Generally poor execution of passes.

5. Questionable close control of the ball when controlling and running with the ball.

Wein (2002) highlighted the quality of the final pass, its execution as well as its reception as the factors that determine to a large extent whether the final touch results in a goal. There could have been technical problems that led to the players having the ball taken away and/or not being able to get the shot in at goal. It appears as if many assists were attempted in the penalty area, however many of them did not result in goals because of either poor passing or interceptions. These results are similar to those found by Armatas *et al.* (2009b) that the lower ranked teams in the league displayed a greater number of assists to no/goals than the top ranked teams who performed a equal number of assists/goals and assists/no goals. These findings may be linked to the technical and tactical quality of the players.

The Hughes *et al.* (1998) study is helpful in shedding some light on the complexity of the interpretation of these results. They classified two different possible causes for giving the ball away: Actions by the player in possession and actions by the receiver. They found that inaccuracy of the pass accounted for the majority of player in possession variables (62%) and actions by the receiver were dominated by a loss of control during reception of the pass (40.9%). Similar results were found in this study. Poor passing made up a large percentage of the outcome of penalty area entries. The other large contributor to losing possession of the ball was an interception (ball taken away), which is a positive action by the defense. In this study, there was an equal balance between interceptions by the defensive team and inaccurate passing by the attacking team as causes for losing possession when the ball enters the penalty area. This is interesting to note, as there appears to be an interlinking between poor passing and interceptions by the opponents. The less accurate the pass the easier it is to intercept. Therefore the passing of the team in this study needs to come into question.

Once the ball enters the penalty area, attacking teams can overcomplicate their task to take a shot at goal. It is interesting to note that 84.2% of the goals scored were as a result of no passes being completed within the area. This highlights that there appears to be a relationship between the number of passes within the area, and the number of goals scored. A diffusion of responsibility can occur in which the ball is passed or attempted to be

passed to another player to take a shot at goal, even when the ball carrier is in a position to score. This possibility is introduced in Wein's statement (2002) that the personalities of the players are reflected in the way they approach the attack and that the players' education and the environment play an important role in determining whether they are creative or tense and afraid to take risks. A tense or cautious player would generally prefer passing the responsibility onto someone else to take the shot at goal, rather than take it themselves possibly due to fear of critical comments from the coach. It is important that once players are in the penalty area (particularly the strikers) that they take responsibility when in possession of the ball in this area. This is not to say that on entering the penalty area a shot needs to be taken at goal, as this is not always possible or effective, but rather that players make quick and effective decisions, not overcomplicate matters and take responsibility for taking shots at goals.

No Goal (21%)

No goal was the third most frequent outcome in the penalty area. The team took on average 14.3 shots at goal per game, with 1.9 of these shots per game resulting in a goal, which means that 13.3% of shots taken at goal were unsuccessfully converted. The three possible reasons for an attempt/shot at goal not resulting in a goal were the shot was off-target (11.8%), there was a goalkeeper save (7.2%) and the shot was blocked (1.9%).

The frequency with which shots were off-target highlighted the importance for coaches to examine more closely the technical ability of the players to successfully hit the target with a shot, as well as their tactical decision making about when and where to take a shot from. As previously mentioned, the reason for the high percentage of shots being off-target could be a product of teammates' difficulties creating good quality scoring opportunities, rather than poor shooting ability on the part of the players taking the shots (Ensum *et al*., 2005).

Possession Maintained (6.1%)

Possession was maintained by means of the ball entering the penalty area, and then leaving the area by being successfully passed to a teammate outside the penalty area. A successful pass was the only reason given for possession being maintained. These passes were most often as described by Wein (2002) - a simple pass (back or horizontal) with the

purpose of securing possession and playing the ball to someone in a better position to proceed with the attack.

Foul (4.5%)

There were no fouls committed by the opponents in the penalty area over the course of the 10 matches that were analysed in this study. This means that there were no penalties or indirect free-kicks awarded in the penalty area. This gives the impression that the opponents practiced good control and restraint and were able to execute legal tackles, interceptions and blocked shots within the penalty area. All the fouls committed following entrances into the penalty area during these 10 matches were made by the attacking team, either as a result of being penalised for being in offside positions, or for physical fouls.

Goal (3.2 %)

Of the 19 goals scored in the 10 matches, 11 goals (1.9% of penalty area entrances) were scored as a result of a good strike at goal, and 8 goals (1.3% of penalty area entrances) were the result of a defensive error by the opponents. This highlights that over the course of the ten matches, errors by defenders were almost as productive in scoring goals as good attacking play.

Summary

The team had a successful home record in terms of the results achieved over the 10 matches, and compared favourably with previous international trends in terms of attacking and defensive play. It is evident in the number of penalty area entries and shots at goal per match that the team had many opportunities to attack and score goals, however there effectiveness and efficiency needs to be questioned

Attacking the penalty area from wide areas of the field appeared to be the major strategy of the team, and they were successful in converting these opportunities into goals in particular from the right side of the field. However they had a good balance of the areas of the field from which they attacked the penalty area and the areas from which they entered the penalty area, which created a sense of unpredictability in their attacking phase of play.

The team scored a large proportion of their goals from set pieces, more than many studies found at other competitions. They were particularly successful with goals scored from corners. The majority of their goals for open play were scored as a result of the ball entering the penalty area from short passes and crosses. This and the fact that the majority of play into the penalty area came from the attacking third of the field indicates a more possession style of football in contrast to the direct style or long ball strategy. However the team did well to use a variety of methods to enter the penalty area, which created a degree of flexibility for the team and unpredictability for their opponents.

Once successfully entering the penalty area the ball was most frequently taken away by the opponents, predominantly as a result of the ball being intercepted by the defenders. The next most common reason for the team's attack being broken down was possession being given away as a result of a poor pass. The ball being taken away is linked to positive actions of the defensive team, whereas the ball being given away is linked to negative play by the attacking team. The fact that the ball is given away so frequently as a result of poor passes and taken away by interceptions highlights that there may be interlinking between poor passing and interceptions. Added to this the fact there were so few completed passes in the penalty area, could be as a result of many of the attempted passes not finding their intended targets.

The technical ability of the attacking team needs to come under scrutiny, due to the fact that such a large percentage of play is given away by interceptions and poor passing. In order be more efficient in terms of its attacking play the team cannot afford to lose possession so frequently by these means. This highlights that passing exercises focusing on technique development and mastery of the skill need to be incorporated into training. Also exercises that work on structured attacking play and its conclusion need to be included in the training programme as shadow play and under conditions of pressure.

The team enters the penalty area a large number of times throughout the course of a match, and one would like to see more goals being scored from the frequency of entries they have. Therefore the quantity vs. quality of the team's attacks needs to be questioned. It appears that they have a quantity focus, and it is recommended that there be a shift towards quality of entries, and getting the ball into the most dangerous areas of the field from which the scoring of a goal is more likely. This requires a tactical change, as well as calls for a higher technical execution of play by all the players.

Chapter Five

Conclusions and Recommendations

The results from performance analysis should lead to recommendations for actions that will enhance the performance of the team and individual players. A report should identify both strengths and weaknesses in order to support coaches' decisions about how to prepare for future matches. The success of performance analysis can ultimately be measured by the extent to which patterns discovered and interpreted by the coaches are transferred onto the field of play. Performance analysis as implemented in this study should inform the coaching process, and thus affect changes in the behaviour of the players on the field.

In order to improve a team's ability to score goals, the coach needs an objective understanding of the team's current patterns of attacking play in terms of both strengths and weaknesses. This study was based on the analysis of 10 home matches using a category set specifically designed to identify patterns of play associated with entries into the penalty area, linking the outcomes of entries to their respective reasons for success or lack of success. A particular challenge in professional football experienced during the study was the changing of players from one match to the next and the influence these changes might have had on the identification of patterns of play.

- The challenge of coordinating the tactical play of a large and frequently changing squad might be resolved by the team adopting a single guiding strategic plan to which all players are recruited, trained and rewarded.

- Differences in the technical abilities of different players will have an influence on the application of tactical principles. Continuously refining the technical skills of all players and emphasising the technical aspects of performance during practice might ensure that the players selected for any given match all have sufficient technical proficiency to perform to the game plan.

The value of a category set to a coach is that it produces information that they need. With that in mind, creating category sets in partnership with the coaches who will be using the information is recommended. The coach of the team involved in this study was quite

comfortable with the investigator completing a performance analysis of his team as a research project but made no commitment to use any of the information generated by the analysis.

The performance profile for the team in this study revealed a pattern of play that does create goal scoring opportunities frequently during matches. However, the team appears to have more of a quantity approach to their attacking play as compared to a quality approach, as the ratio of entries to shots at goal and entries to goals is relatively high. It is recommended that practical steps be taken to reduce these ratios, making the team more efficient and effective in their attacking play. The technical and tactical reasons for goals being scored need to be addressed, and in particular the frequency at which the ball is intercepted and given away as a result of a poor pass.

Recommendations for Professional Practice

Performance analysis is focused with identifying aspects that can be addressed to help improve a team's performance, and ultimately their ability to score goals and win matches. In order to assist the team in becoming more efficient and effective in converting their attacking opportunities into goals, it is important that attention is given to the following aspects of performance during training:

- Technical abilities of the team – the coach needs to set aside time during the training to enhance the technical abilities of the players. In particular, attention needs to be given to passing and crossing the ball into the penalty area as possession is frequently being given away as a result of poor passing and interceptions.

- Tactical awareness – the teams' tactical behaviour in the attacking third of the field needs to be trained. In particular how to make support runs into the penalty area, and when to make the telling pass to the support players.

- Decision-making – time needs to be spent on training the players to keep calm when entering the penalty area, as well as not overcomplicating the process of attempting a shot at goal. The main focus for the ball carrier once entered the penalty area is to get into a position to take a shot at goal and if it is not possible to take a shot at goal, then a pass needs to be made to a team mate in a better

position. Scoring a goal is not only about the ball carrier, but also about the support players. The ability of the support players to move into positions to either open up space for the ball carrier, or to get into goals scoring positions themselves is of crucial importance, and needs to be trained on the field.

The above highlights the areas of training that need to be developed for the team to enhance their ability to score goals. It is of crucial importance that the youth players and future professionals receive technical, tactical and decision making training from an early age, as this will fast track their development, and will make quicker progress up the ranks than players who have not received this type of training.

If the team want to enhance their ability to score goals during matches it is recommended that they consider the following tactical applications during matches:

- Attack more from the right central and right side of the field.
- Get the ball into the attacking third of the field more often in particular areas 3 and 5.
- Keep passes within the penalty area to a minimum.
- Capitilise on set pieces.
- Improve their ability to cross the ball into the area. Many goals in the matches were scored from corners. Therefore by providing crosses into the penalty area the set piece can be applied in open play situations.

The insights generated from performance analysis can be used to guide professional practice in several areas of application, including the following three:

- Training session design.
- Player and team feedback.
- Long-term player development.

Training Session Design

In order for a coach to plan a training session, they need to be aware of their own team's strengths and weaknesses as well as the strengths and weaknesses of the opposition. It is recommended that the planning of training sessions be linked to what is extracted from the performance analysis of the team's match play. To achieve this, a close working relationship is proposed between the performance analyst and coach. The performance analyst has the role of providing the required information to the coach, and then the coach needs to put this information into practice by developing training sessions to work on the specific areas that need to be addressed before the next match. By implementing a consultation system between the coach and analyst, the coach will have a more objective base of information and point of view from which to prepare the players for their next match.

It is recommended that the consultation procedure and subsequent design of training sessions involve the following steps:

1. A meeting is held between the coach and the analyst, and the coach specifies any areas of game play in which they are particularly interested. If real-time feedback on game performance is going to be needed, that need should be defined at this time.

2. A quality video recording of the match is completed. Real-time feedback can be provided as statistics or grouping of video clips according to the areas agreed on prior to the match.

3. A brief post-match meeting between the coach and analyst is held in which the coach may highlight specific areas that they want looked at based on their observations and/or subjective thoughts regarding the match.

4. The analyst completes the analysis using one or more category sets based on the coach's expressed needs for information (steps 1 and 3 above). The category sets could address team and/or individual player performance.

5. The analyst organises and presents the data from the category set(s) in a user-friendly format so that the coach can interpret the meaning of the data.

6. The analyst and coach meet as soon as the analysis has been completed (the sooner the better after the match) and the findings of the analyst are shared with the coach both visually and in data format. The coach may want to discuss the patterns found in the data with the analyst and may ask for some additional analysis of the match or certain players.

7. The coach can then use the information provided by the analyst to structure the post-match meeting with the team. This information is critical for planning the next training session.

The working relationship between the coach and analyst will directly affect the potential of performance analysis to support the coaching process. The specifics of how that relationship might unfold in a real-world situation are presented in the following five sub-sections using one of the matches analysed in this study as an example:

1. Describe the football problem.
2. Highlight the statistics that support the occurrence of this problem.
3. Prepare the feedback session with the team.
4. Presentation of the subsequent training sessions.
5. Analysis and evaluation.

Describe the Football Problem

After completing the performance analysis based on the category set designed to identify patterns of attacking play into the penalty area, the analyst found that during attacking play and especially in the attacking third of the field, the team created numerous opportunities but failed to score.

- They attacked from the wide areas of the field frequently and crossed the ball into the penalty area. However, they were not able to convert these opportunities into goals.

- The crosses played into the area were not of a very high quality, which resulted in the ball being given away by means of poor passing or being intercepted by the opposition defenders and goalkeeper.

- The opponents played with four players in defense and made use of mixed marking (zonal marking further in their defensive third but man-to-man marking within the penalty area).

- The two central defenders of the opponents were shorter in stature than both of our strikers. It also did not appear as if the strikers were well-positioned within the area and were not successful in losing their markers to score.

- The wingers were most frequently the players performing the crosses.

Provide the Statistics that Define the Occurrence of this Problem

The performance analyst calculated the following statistics regarding the teams' performance to support the definition of the football problem:

- The team had 81 entries into the penalty area during the course of the match.

- 10 of these entries were as a result of crosses into the area.

- Of the crosses 7 were from Area 1 (left side) and 3 were from 3 were from Area 2 (right side).

- None of the entries resulted in an attempt at goal.

- Of the entries into the penalty area 4 were given away by means of poor passing.

- 5 were taken away – 3 by means of interceptions by defenders and 2 as a result of interceptions by the goalkeeper.

- Possession was maintained only for one of the crosses, and this was due to a poor cross that left the penalty area and fortunately found a team mate in Area 2.

Feedback Session with the Team

A video and data feedback session is held with the team. A PowerPoint presentation is prepared detailing the general performance of the team based on the information supplied by the analyst. The focus of the session is on the conversion of attacking play into goals. The coach reinforces that the team cannot have so many opportunities and fails to score. The majority of the time in the session is spent observing the video clips of the crosses played into the penalty area, and discussing their outcomes. The key focus points for this post-match feedback session include:

1. Positioning of the players within the penalty area.
    - The strikers need to lose their markers.
    - Players must time their runs into the area based on the position of the ball carrier.
    - Players must get into the critical areas of the penalty area quicker.
2. The areas of the penalty area in which the balls are being played.
    - Avoid getting too close to the goal keeper.
    - Try to use more out-swinging crosses that leave the goal keeper in two minds and meet oncoming strikers.
    - Play the ball at head height for the two tall strikers.
3. Timing of the cross.
    - Rather hold the play up and wait for support than play the ball into the area when there are no players to aim at.

    Notable comments made by the players during the feedback session included:

    - Strikers - The strikers felt that the crosses were played into the penalty area before they were given time to get into position.

- Wingers - The wingers felt that their team mates were not keeping up with play, as when they got into position to cross they did not have many players to aim at.

The feedback session concludes with a description of what will happen in the next training session (*i.e.* the next two training sessions will focus on aspects of crossing in order to score). As players leave they receive a summary of the analysis of their performance and the team's performance and video clips of their individual performance.

Preparation of the Subsequent Training Sessions

The information drawn from performance analysis informs the coaching process. Many coaches include players in making decisions about the content for subsequent training sessions once the players have had access to the results of performance analysis. For this example, the following two practice activities might be suggested for the team in this study to address their problems converting attacking play into goals.

Practice Activity A – Organisation (see Figure 27).

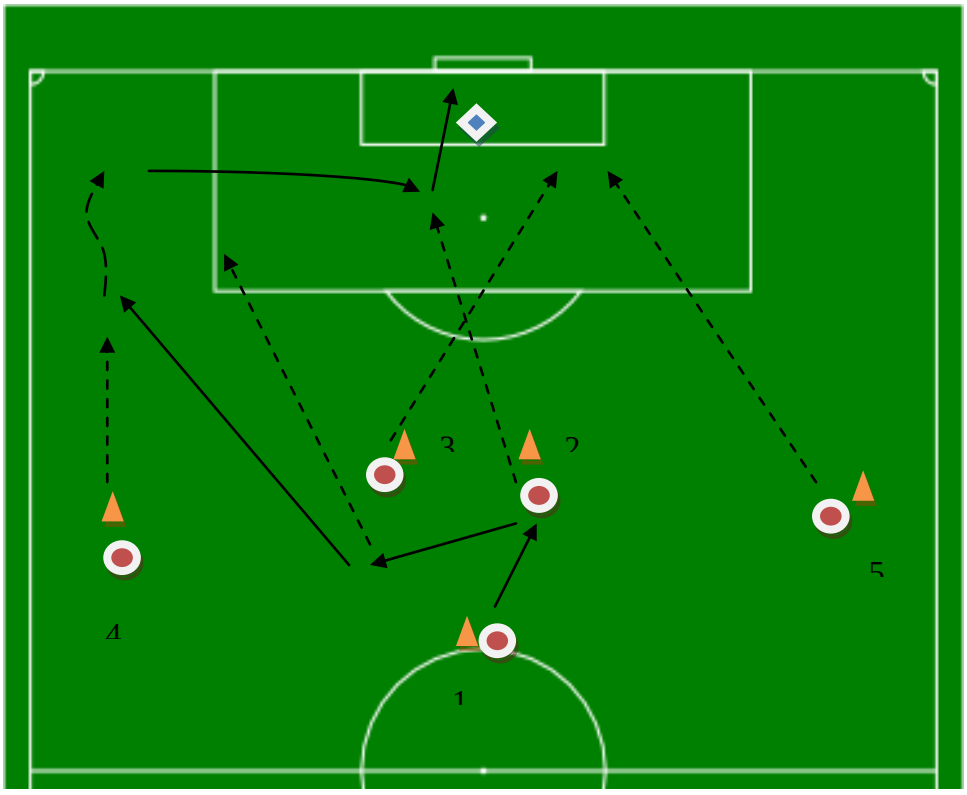


Figure 27. *Practice activity A.*

Description

- The exercise begins at cone 1 and the ball is passed to the player at cone 2 who returns the pass to player who has moved off of cone 1.
- The player from cone 1 then plays the ball into space for the player on cone 4.
- As player 1 makes the pass to player 4, the players from cone 1, 2, 3, 5 make their runs into the penalty area.
- The player from cone 4 dribbles with the ball, looks up and crosses the ball into the penalty area.
- The exercise is then performed from the other side.

Variations

- Instead of the ball being returned to the player moving off of cone 1, player on cone 2 passes to the player on cone 3 who switches play to the player on cone 5 who crosses the ball into the penalty area.

Progressions

- Place defenders in the penalty area to apply pressure on the players entering the area.
- Place a shadow defender on the player crossing the ball into the penalty area.

Evaluation of the activity (done after completion of the activity)

- There was an improvement in how effectively the activity was performed towards the end of the session.
- However, the wide players had less success in crossing quality balls into the area when under pressure from opponents.

Practice Activity B – Organisation (see Figure 28).

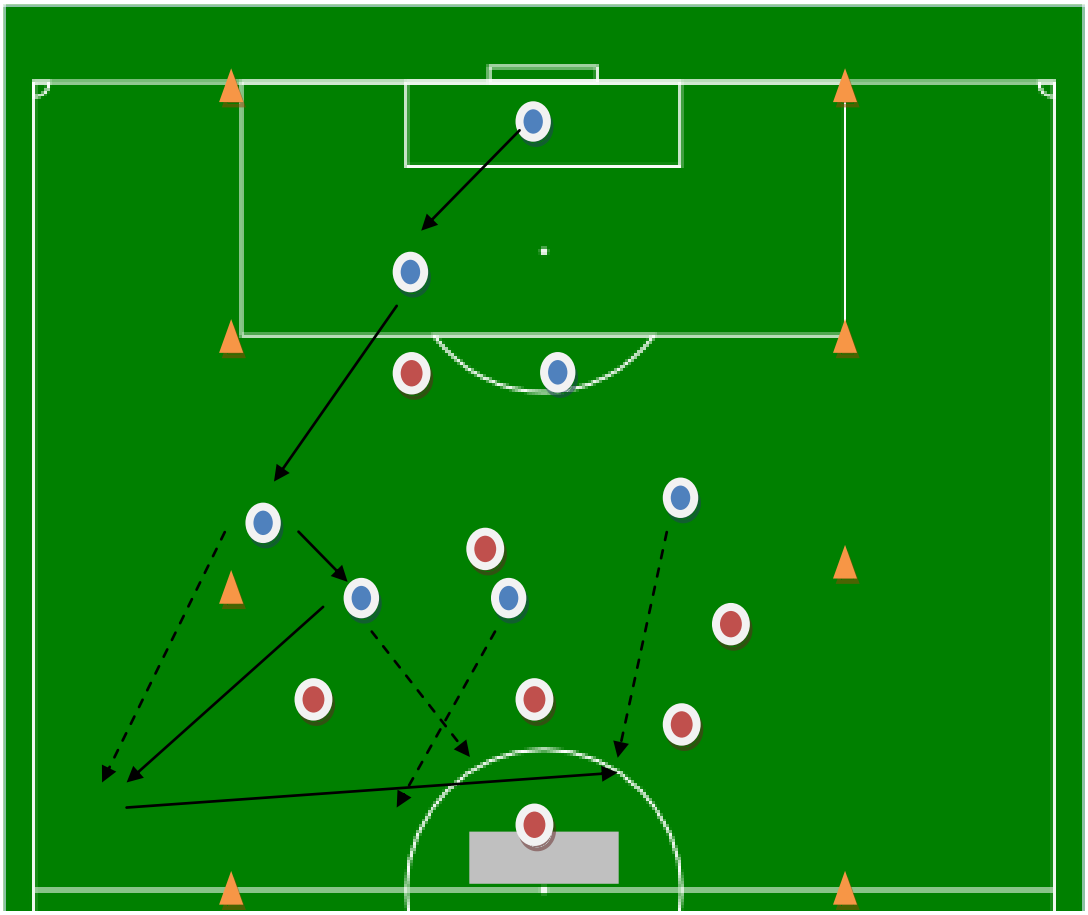


Figure 28. *Practice activity B.*

Description

- Two teams of seven players each make use of half of the field.
- Two free zones are demarcated by means of cones from the base of the penalty area to the halfway line in which only one player of the team in possession of the ball can enter.
- Play begins with the goalkeepers who distribute the ball.
- The team in possession of the ball builds up play, and needs to move the ball into the free zones, from which the ball needs to be crossed, as a goal can only be scored directly from a cross.

Progressions

- One opponent is allowed into the free zone in order to place the ball carrier under pressure.
- Remove the free zones and play a game in which a goal from open play is equal to 10 points, and a goal from a direct result of a cross is equal to 20 points.

Evaluation (done after completion of the activity)

- The team applied the elements of the previous exercise well, and there were a total of six goals scored directly as a result of the ball being crossed. Work is needed on the timing of the player's runs into the area and quality of the passes.

Player and Team Feedback

In order for there to be lasting changes of behaviour in the team and on the part of individual players, feedback regarding match performance should be given frequently and in an easy to understand format. Feedback should take place on both an individual and group/team level. Individual analysis means that the player receives information concerning personal performance in the match, and group feedback means that the players receive feedback that is general to the team, even though there may be specific reference to individual players. Table 11 provides examples of individual feedback and Table 12 examples of group/team feedback.

It is recommended that players receive feedback both individually and as part of a group. This will allow the players to see that their individual actions on the field are important and that their performance makes a contribution to the performance of the team. When individual performance analysis is not implemented, the players have 'somewhere to hide' as there are no measurable aspects of their performance and it is not possible to objectively assess how a particular player has performed. Individual player analysis allows the player to keep a record of their performance from game to game as well as over the course of the season.

Table 11.

Individual player feedback.

Method of Feedback	Description	Recommended Frequency
Data	Players receive a document with a focused individual player analysis of themselves.	After every match.
Video	Players receive video clips of their own performance based on their involvement in the match or specific events.	After every match.
Individual Meetings	Coach meets with all individual players to provide them feedback regarding their performance in the matches.	Monthly/Bimonthly Evaluations.

Table 12.

Group/team feedback.

Method of Feedback	Description	Recommended Frequency
Data	Players receive a document detailing by means of figures and brief descriptions the teams overall performance in the match.	After every match.
Video	Players watch a recorded version of the whole match. Players watch a recorded version of specific events of the match.	After every match.
Team Meeting	The coach meets with the squad to give feedback general and critical aspects of performance during the match.	After every match.
Group Meetings	Coach meets with groups of players (such as defenders, etc.) to discuss the specific aspects of performance.	As required.

It is of particular importance that a format for analyzing individual players is decided on at the beginning of the season to ensure consistency in monitoring the players from game to game. By keeping a record of each individual as well as the team's performance, the analyst is able to identify trends in individual and/or team play that needs work. A performance analysis monitoring system also allows the coaches to assess whether what they do in practice transfers onto the playing field.

In summary the use of performance analysis to support feedback should ensure the following:

- Feedback is given to the players after every match if the situation allows.
- Feedback is given on both an individual player and general team level.
- Feedback is provided using a uniform template so that performance monitoring over the course of the season is made possible.

Long-Term Player Development

In order for young players to reach their full potential, professional clubs often follow a systematic approach to player development. Long-term systems encourage logical and integrated training and practice programmes. At every level there is a set of measurable outcomes that focus on the players' technical, tactical, physical, cognitive, and social development. Any weaknesses identified can then be taken up and addressed with each individual player. A systematic approach has the potential to raise the standard of the game, including a positive influence the scoring of goals.

The personality, style of coaching and training activities of the coach is of particular importance to the development of players. The recruitment of talented young players doesn't ensure their ultimate success, but also the environment that the junior players are exposed to. It is therefore important that the coach is well trained to work with junior players and help them reach their full potential. Learning opportunities need to be made available for individuals who want to get involved with coaching, and in particular junior coaching. It is recommended that a licensing policy be implemented within South Africa that only allows licensed coaches to work with junior players. This will assist in developing coaches who know how to work with children and how to best train them.

Besides developing the players technically, tactically, mentally and physically, it is important that the coach has a positive influence on the players, and assists then to be able to make good decisions for themselves both on and off the field. With regards to the scoring of goals, the players need to be taught to be creative, take risks and not to be fearful of the consequences. The coach therefore has the responsibility of creating and fostering a supportive learning environment.

Many regional leagues for junior players in South Africa, involve players at the age of 11 years old playing 11 vs. 11 football matches on the same size field as that of adults. This approach to competition and player development needs to be questioned in particular as to how well it fits the level of the players as well as its effectiveness as a means to develop players. Current approaches to long-term athlete development suggest that up to the age of 11, football teams consist of a smaller number of players and that competitions take place on smaller modified fields that encourages technical and tactical mastery of fundamentals. Teams can consist of 5 to 7 players per side and the smaller area will allow for each player to have more touches on the ball. The use of small-sided games at training also encourages coaches to specifically target critical tactical situations and sequences of play applied in games contexts, thus contributing to the technical, tactical and cognitive development of the players.

The use of performance analysis in long-term player development is particularly valuable for monitoring the progress of individual players and for describing tactical efficiency and effectiveness of teams according to the measurable outcomes identified for each step in the system. Performance analysis could be helpful in the evaluation of coaches as well as players, since the role of the coach in the development system is not so much on winning as it is on implementing training programmes that produce technically proficient and tactically sound players.

Recommendations for Future Research

The uniqueness of this study was that it focused on the penalty area as the critical area for attacking play and described how successful and unsuccessful efforts to score were created by a single football team in the PSL during 10 of their home matches. As an example of descriptive research, its findings can only be applied to the team that agreed to participate in this study. However, the results of the study do encourage thinking about

how performance analysis might contribute in future research to help develop football in South Africa.

- Performance analysis could be pursued to study the goal scoring patterns of more of the teams in South African football, including the national team. The importance of scoring goals has been highlighted throughout the study, and by gaining insight into how South African teams attack and defend, a more scientific approach can be taken to improving their performance.

- Statistical analysis in the study mainly took the form of frequency tables, means and percentages in order for the data to be presented in an easy to understand format for coaches as well as to allow comparisons with previous research that also made use of percentages, means and frequency counts. It is recommended that in the future once a larger performance database has been developed, more complex statistical methods be utilized, as well as the concept of data normalization being investigated.

- The results of a nationally-based performance analysis project could provide the information needed to compare styles of South African play to the patterns of international competitors. The collection of national records such as those performed in Greece (Galanis Sports Data online databases) will allow for more accurate comparisons with the play of South African teams and individual players.

- Research using performance analysis should focus on attacking play more holistically, such as the number of passes and lengths of possession over the whole field, and not only in terms of the concluding aspects of attacking play.

- Research should be performed on the defensive playing patterns of teams within South African football.

- Performance analysis could be used to explore the relationship between the actions of the ball carrier and the player in support is unpacked in more detail to better understand why attacking play has broken down. This would involve an evaluation of player's decisions both on and off the ball and would take a more tactical approach to the study of the game than was taken in the present study.

- Performance analysis could generate critical information about the transfer of tactical and technical learning from practice sessions to play in matches. This technology would allow a comparison of performances at practice to performance in matches. Information from such an analysis could provide objective information about the effectiveness of different styles of coaching and/or different approaches to the content and scheduling of practices.

- It could also be helpful if studies were completed among South African PSL teams to determine their use of performance analysis, the coaches and players buy-in as well as the systems that the club have implemented to provide feedback to the players. By identifying the perceptions and attitudes of club officials, players and coaches towards performance analysis, the reasons for some clubs deciding not to make use of it might be understood and addressed.

A Final Comment

It may be the case that some clubs believe it is the coach's responsibility alone to analyse team performance. However, the complexity of top level football today and the extraordinary financial implications of winning and losing demand that professional attention be given to the analysis of matches. Even with computer-based video technology, performance analysis of team and individual play is a time consuming process, and the coach does not always have this time available to perform the task to a high enough standard.

Every professional team should have a dedicated performance analyst who is responsible for working with coaches and players to ensure accurate information is available to support the coaching process. There may be reasons why the implementation of performance analysis has not yet achieved its potential:

- Financial resources - The equipment is expensive and does require a qualified person to get full benefit from all of its features. The clubs may feel they cannot afford the equipment and/or the payment of another staff member.

- Knowledge – There may not be a full understanding and appreciation of the critical contribution that the insights gained from performance analysis can make to improving team and individual performance.

- Discomfort with technology – It is possible that some coaches and players are concerned that the objective information generated through performance analysis could put their performance in a bad light.

- Expertise– There are not many people who have the necessary skills and expertise to implement the more sophisticated systems that are used in performance analysis to provide feedback to the coach and players as well as monitor their performance.

If the resources can be found to implement performance analysis to a professional standard for more clubs, then the success of these applications will encourage the growth of performance analysis as a support service. It may be necessary to spend time changing perceptions held by some coaches and officials within clubs that performance analysis is a "nice to have" instead of "need to have." Hopefully, the continued success of teams that use performance analysis and improvements in the user-friendly aspects of the technology will results in an increase in use and, in the case of the team in this study, an improvement in the conversion of attacking play into the scoring of goals.

References

Abt, G.A., Dickson, G., Mummery, W.K. (2002). Goal scoring patterns over the course of a match: An analysis of the Australian National Soccer League. In W. Spinks, T. Reilly & A. Murphy (Eds.), *Science and Football IV* (pp. 106-111). London: E & FN Spon.

Armatas, V., Yiannakos, A., Zaggelidis, G., D., Papadopolous, S., Fragkos, N. (2009a). Differences in offensive actions between top and last teams in Greek first soccer division. A retrospective study 1998-2008. *Journal of Physical Education and Sport*, 23(2), 1-5.

Armatas, V., Yiannakos, A., Zaggelidis, G., Skoufas, D., Papadopolous, S., Fragkos, N. (2009b). Goal scoring patterns in Greek top leveled soccer matches. *Journal of Physical Education and Sport*, 23(2), 1-5.

Bangsbo, J. & Peitersen, B. (2000). *Soccer Systems & Strategies*. Champaign, IL: Human Kinetics.

Bate, R. (1988). Football chance: tactics and strategy. In T. Reilly (Ed.), *Science and Football* (pp. 293-301). London: E & FN Spon.

Belka, D.E. (2000). Developing competent game players: Rationale and tactics. *Teaching Elementary Physical Education*, 12(3), 6-7.

Bell-Walker, J., McRobert, A., Ford, P. & Williams, M.A. (2006). Quantitative analysis of successful teams at the 2006 World Cup Finals. *Insight – The FA Coaches Association Journal*, Autumn/Winter 6, 37-43.

Bloomfield, J.R., Polman, R.C.J. & O'Donoghue, P.G. (2005). Effects of score-line on team strategies in FA Premier League Soccer. *Journal of Sport Sciences*, 23, 192-193.

Bouchard, C., Malina, R.M. & Perusse, L. (1997). *Genetics of fitness and physical performance.* Champaign, IL: Human Kinetics.

Borrie, A. (1996). Coaching Science. In T. Reilly (Ed.), *Science and Soccer* (pp. 243-257). London: E & FN Spon.

Boyko, R.H., Boyko, A.R. & Boyko, M.G. (2007). Referee bias contributes to home advantage in English Premiership football. *Journal of Sport Sciences*, 25, 1185-1194.

Breen, A., Iga, J., Ford, P. & Williams, M. (2006). World Cup 2006 – Germany. A quantitative analysis of goals scored. *Insight – The FA Coaches Association Journal,* Autumn/Winter, 6, 45-53.

Brown, S., & Hughes, M. (2004). The attacking playing patterns in offensive areas of European, South American, African and Asian teams in the 2002 World Cup for association football. In P. O'Donoghue, & M.D. Hughes (pp. 92-102), *Performance Analysis of Sport VI*. Cardiff: Centre for Performance Analysis.

Carling, C., Reilly, T., Williams, A.M. (2009). *Performance assessment for field sports.* London: Routledge.

Carling, C., Williams, A.M. & Reilly, T. (2005). *Handbook of soccer match analysis: A systematic approach to improving performance*. London: Routledge.

Carron, A.V., Loughhead, T.M. & Bray, S.R. (2005). The home advantage in sport competitions: Courneya and Carron's conceptual framework a decade later. *Journal of Sport Sciences,* 23, 395-407.

Cook, M. (1996). The science of soccer management. In T, Reilly (Ed.), *Science and Soccer*
(pp. 259-271). London: E & FN Spon.

Dunn, A., Ford, P. & Williams, M. (2003). A technical profile of different playing positions.
Insight – The FA Coaches Association Journal 6(4), 41-45.

Ekblom, B. (1994). Football (Soccer): *Olympic handbook of sport medicine.* New Jersey: Wiley-Blackwell.

English Premier League (2009). Statistics. Retrieved July 15, 2009 from http://www.premierleague.com/page/Statistics/0,, 12306,00.html.

Ensum, J., Pollard, R. & Taylor (2005). Applications of logistic regression to shots at goal in
association football. In T Reilly, J. Cabri, D. Araújo (Eds.), *Proceedings of the 5th Congress of Science and Football, Lisbon, 11-15th April 2003* (pp. 211-218). Abingdon: Routledge.

Ericsson, K.A., Krampe, R.T. & Tesch-Romer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100,* 363-406.

Fédération Internationale de Football Association (2009a). *Laws of the game 2009*. Switzerland: Fédération Internationale de Football Association.

Fédération Internationale de Football Association (2009b). FIFA World Cup™ Record – Organisation. Retrieved July 15, 2009 from http://www.fifa.com/worldfootball/statisticsandrecords/tournaments/worldcup/organisation/ index.html.

Fédération Internationale de Football Association (2004). *FIFA Coaching*. Switzerland: Fédération Internationale de Football Association.

Franks, I.M., (1997). Use of feedback by coaches and players. In J. Bangsbo, T. Reilly, & M.D. Hughes (Eds.), *Science and Football III*, (pp. 267- 278). London: E & F.N, Spon.

Franks, I.M., & Miller, G. (1986). Eyewitness testimony in sport. *Journal of Sport Behaviour*, 9(1), 39-45.

Franks, I.M. (2004). The need for feedback. In M. Hughes, & I.M. Franks (Eds.), *Notational Analysis of Sport (*pp. 8-16).London: Routledge.

Franks, I.M. & Miller, G. (1991). Training coaches to observe and remember. *Journal of Sport Sciences,* 9, 285-297.

Grant, A.G., Williams, A.M. & Reilly, T. (1999). Analysis of goals scored in the 1998 World Cup. *Journal of Sport Sciences*, 17, 826-827.

Gargantua, J. & Concalves, G. (1997). Comparison of successful attacking play in male and female Portuguese national soccer teams. In M.D. Hughes, (Ed.), *Notational analysis of sport I & II* (pp.79-85). Cardiff: UWIC.

Goncalves, J.T. (1998). *The principles of Brazilian soccer*. USA, Pennsylvania: Reedswain.

Gratton, C. & Jones, I. (2004). *Research methods for sport studies*. Abingdon: Routledge.

Grehaigne, J.F., Godbout, P. & Bouthier, D. (1999). The foundations of tactics and strategy in team sports. *Journal of Teaching in Physical Education,* 18, 159-174.

Grehaigne, J.F., Godbout, P. (1995). Tactical knowledge in team sports from a constructivist and cognitive perspective. *Quest, 47,* 490-505.

Grehaigne, J.F., Marchal, D. & Dupat, E. (2002). Regaining possession of the ball in the

defensive areas in soccer. In W. Spinks, T, Reilly & W. Murphy (Eds.), *Science and Football IV* (pp.112-120). London: Routledge.

Grehaigne, J.F., Godbout, P. (1998). Formative Assessment in Team Sports in a Tactical Approach Context. *The Journal of Physical Education, Recreation & Dance,* 69(1), 46-51.

Griffiths, D.W. (1999). *An analysis of France and their opponents at the 1998 soccer World Cup with specific reference to playing patterns.* Unpublished master's thesis, University of Wales Institute, Cardiff, Wales.

Griffin, L.L., Mitchell, S.A., & Oslin, J.L. (1997). *Teaching sports concepts and skills: A tactical approach*. Champaign, IL: Human Kinetics.

Hill, A. & Hughes, M. (2001).Corners in the European Championship for association football.

In M.D. Hughes & I.M. Franks (Eds.), *Pass.com: Computer Science and Sport III & Performance of Sport V* (pp. 285-294). Cardiff: University of Wales Institute.

Helsen, W.F., Hodges, N.J., Van Winckel, J. & Starkes, J.L. (2000). The roles of talent, physical precocity and practice in the development of soccer expertise. *Journal of Sport Sciences,* 18, 727-736.

Hewer, L., & James, N. (2004). Goal scoring strategies of a top Premiership team in European

and British Competitions. In P. O'Donoghue, & M.D. Hughes (pp. 71-74), *Performance Analysis of Sport VI*. Cardiff: Centre for Performance Analysis.

Hodges, N.J. & Franks, I.M. (2004). The nature of feedback. In M.D Hughes & I.M Franks (Eds.), *Notational Analysis of Sport* (pp. 17-39). London: Routledge.

Hook, C. & Hughes, M. (2001). Patterns of play leading to shots in Euro 2000. In M.D. Hughes & I.M. Franks (Eds.). *Pass.com: Computer Science and Sport III & Performance of Sport V* (pp. 295-302). Cardiff: University of Wales Institute.

Horn, R. Williams, M., & Ensum, J. (2002). Attacking in central areas: A preliminary analysis of attacking play in the 2002/2002 F.A. Premiership season. *Insight – The FA Coaches*

Association Journal, 3, 31-34.

Howe, M.J.A., Davidson, J.W. & Sloboda, J.A. (1998). Innate talents: Reality or myth? *Behavioural and Brain Sciences,* 21, 399-442.

Hughes, M., Robertson, K. & Nicholson, A. (1988). Comparison of patterns of play of successful and unsuccessful teams. In T. Reilly, A. Lees, K. Davids, & W.J. Murphy (Eds.), *Science and Football* (pp. 363-368). London: E & FN Spon.

Hughes, M. & Franks, I.M., (2005). Analysis of passing sequences, shots and goals in soccer.

Hughes, M.D. & Petit, A. (2001). Patterns of play in the 1986 and 1998 World Cups for soccer. M.D. Hughes & I.M. Franks (Eds.). *Pass.com: Computer Science and Sport III & Performance of Sport V* (pp. 267-276). Cardiff: University of Wales Institute.

Hughes, M.D. & Churchill, S. (2005). Attacking profiles of successful and unsuccessful teams in Copa America 2001. In T. Reilly, J.Cabri, & D. Araújo (Eds.), *Proceedings of the 5th Congress of Science and Football, Lisbon, 11-15th April 2003* (pp. 219-224). Abingdon: Routledge.

Hughes, M.D., Snook, N. (2006). Effectiveness of attacking play in the 2004 European Championships. In H. Dancs, M.D. Hughes & P. O'Donoghue (Eds.), *Proceedings of the 2006 World Conference of Performance of Sport VII*, Szombathely, 23-26 August 2006 (pp. 46-62).

Hughes, M.D., Langridge, C. & Dawkin, N. (1998). Perturbations leading to shooting in soccer. In Hughes, M.D. & F. Tavares (Eds.), *Proceedings of the IV World Congress of Notational Analysis of Sport, Porto, 22-25 September 1998* (pp.23-32). Portugal: Centre for Team Sports Studies, Faculty of Sport Sciences and Physical Education, University of Porto.

Hughes, M.D., Probert, G. (2006). A technical analysis of elite male soccer players by position and success. In H. Dancs, M.D. Hughes & P. O'Donoghue (Eds.). *Proceedings of the 2006 World Conference of Performance of Sport 7*, Szombathely, 23-26 August 2006, pp. 76-91.

Hughes, C. (1996). *Soccer Skills: Tactics and Teamwork.* London: Diamond Books.

James, N., Mellalieu, S.D. & Holley, C. (2002). Analysis of strategies in soccer as a function of European and domestic competition. *International Journal of Performance in Sport*, 2, 85-103.

James, N. (2006). The role of notational analysis in soccer coaching. *International Journal of Sport Science and Coaching.* 1(2), 185-198.

Japheth, A. & Hughes, M. (2001). The playing patterns of France and their opponents in the

World Cup for association football, 1998, and the Championship, 2000. In M.D. Hughes & I.M. Franks (Eds.), *Pass.com: Computer Science and Sport III & Performance of Sport V* (pp.277-284).Cardiff: University of Wales Institute.

Johnston, R. (2008). On referee bias, crowd size, and home ground advantage in the English soccer Premiership. *Journal of Sport Sciences,* 26(6): 563-568.

Jones, P.D., James, N. & Mellalieu (2004). Possession as a performance indicator in soccer. *International Journal of Performance Analysis of Sport,* 5, 61-71.

Kirk, K. (2005). Model-based teaching and assessment in physical education: The tactical games model. In K. Green, & K Hardman (Eds.), *Physical Education: Essential Issues* (pp. 128-142). London: Sage Publications.

Kirkendall, D.T., Dowd, W.W. & DiCicco, A.D. (2002). Patterns of successful attacks: a comparison of the men's and women's world cup. *Revista de Futebol y Ciencia,* 1(1):29-36.

Lanham, N. (2005). The goal complete: the winning difference. In T. Reilly, J. Cabri, & Araújo (Eds.), *Proceedings of the 5th Congress of Science and Football, Lisbon, 11-15th April 2003* (pp. 194-200). Abingdon: Routledge.

Launder, A.G. (2001). Play Practice: *The games approach to teaching and coaching sports*. Champaign: IL: Human Kinetics.

Low, D., Taylor, S., Williams, M. (2002). A quantitative analysis of successful and unsuccessful teams. *Insight – The FA Coaches Association Journal,* 4, 32-34.

Lucchesi, M. (2001). *Attacking soccer: A tactical analysis*. Spring City, PA: Reedswain Publishing.

Luhtanen P., Belinskij A., Häyrinen M. & Vänttinen T. (2001). A comparative tournament analysis between the EURO 1996 and 2000 in soccer. *International Journal of Performance* Analysis in Sport 1(1), 74-82.

Madrigal, R. & James, J. (1999). Team quality and the home. *Journal of Sport Behaviour,* 22,

381-398.

Magill, R.A. (2003). *Motor Learning and Control: Concepts and Applications* (7th ed.). New

York: McGraw Hill.

Mohr, M., Krustrup, P. & Bangsbo (2005). Fatigue in soccer: a brief review. *Journal of Sport sciences,* 23:593-599.

More, K., & Franks, I.M. (2004). Measuring coaching effectiveness. In M.D. Hughes, & I.M. Franks (Eds.), *Notational analysis of Sport (2nd ed.)* (pp.243-256). London: Routledge.

Neave, N., & Wolfson, S. (2003). Testosterone, territoriality, and home advantage. *Physiology and Behaviour, 78*, 269-275.

Nevill, A. & Holder, R. (1999). Home advantage in sport: An overview of studies on the advantage of playing at home. *Sport Medicine,* 28, 221-236.

Nevill, A.M., Newell, S. & Gale, S. (1995). Can the crowd influence the result of soccer matches? *Journal of Sport Sciences,* 13, 69.

Nevill, A.M., Balmer, N.J., & Williams, A.M. (2002). The influence of crowd noise and experience upon refereeing decisions in football. *Psychology of Sport and Exercise,* 3, 261-272.

Njororai, W.W.S. (2004). Analysis of the goals scored at the 17th World Cup Soccer tournament in South Korea-Japan 2002. *African Journal of Physical Education, Recreation and Dance.* 10(4), 326-332.

O' Donoghue, P. & Tenga, A. (2001). The effect of score-line on work rate in elite soccer. *Journal of Sport Sciences,* 19, 25-26.

Olsen, E. (1988). An analysis of goal scoring strategies in the World Championship in Mexico 1986. In T. Reilly (Ed.), *Science and Football* (pp. 65-81). London: E & FN Spon.

Olsen, E. & Larsen, O. (1997). Use of match analysis by coaches. In J.Bangsbo, T. Reilly, & M.D. Hughes (Eds.), *Science and Football III* (pp 209-220). London: EF & N Spon.

Pollard, R. & Pollard, G. (2005). Long-term trends in home advantage in professional team sports in North America and England (1876-2003). *Journal of Sports Sciences,* 23, 337-350.

Pollard, R. (1997). Measuring the effectiveness of playing strategies at soccer. *The Statiscian,* 46(4), 541-550.

Pollard, R., Reep, C. & Hartley, S. (1988). The quantitative comparison of playing styles in soccer. In T. Reilly (Eds.), *Science and Football* (pp. 309-315). London: E & F.N. Spon.

Premier Soccer League (2009). Premiership stats. Retrieved July 15, 2009 from http://www.psl.co.za/content.asp?id= 16493.

Reep, C. & Benjamin, B. (1968). Skill and chance in association football. *Journal of the Royal*

Statistical Society. 131(4), 581-585.

Reilly, T. (2003). Motion Analysis and physiological demands. In T. Reilly, M. Williams (Eds.), *Science and soccer.* London: Routledge.

Sanderson, F. (1996). Psychology. In T. Reilly (Ed.), *Science and soccer* (pp. 273-308). London: E. & F.N. Spon.

Sasaki, Y., Nevil, A. & Reilly, T. (1999). Home advantage: A case study of Ipswich Town football club during the 1996-97 season. *Journal of Sports Sciences,* 17, 831.

Shaw, J., & O'Donoghue, P. (2004). The effect of score line on work rate in amateur soccer. In P. O'Donoghue, & M.D. Hughes (pp. 84-91), *Performance Analysis of Sport VI.* Cardiff: Centre for Performance Analysis.

Sousa, T., & and Gargantua, J. (1998). The importance of set-plays in soccer. In Hughes, M.D. & F. Tavares (Eds.), *Proceedings of the IV World Congress of Notational Analysis of Sport, Porto, 22-25 September 1998 (pp.53-57).* Portugal: Centre for Team Sports Studies, Faculty of Sport Sciences and Physical Education, University of Porto.

Sutter, M.., & Kocher, M.G. (2003). Favouritism of agents: The case of referees' home bias. *Journal of Economic Psychology*, 25, 461-469.

Szwarc, A. (2004). Effectiveness of Brazilian and German teams defeated by them during the 17th FIFA World Cup. *Kinesiology*, 36(1), 83-89.

Taylor, J.B., Mellalieu, S.D. & James, N. (2004). Behavioural comparisons of positional demands in professional soccer. *International Journal of Performance Analysis in Sport*, 4, 81-97.

Taylor, J.B., Mellalieu, S.D. & James, N. (2005a). A comparison of individual and unit tactical behaviour and team strategy in professional soccer. *International Journal of Performance Analysis of Sport*, 5, 87-101.

Taylor, J.B., James, N. & Mellalieu, S.D. (2005b). Notational analysis of corner kicks in English premier league soccer. In T. Reilly, J. Cabri, & D. Araújo (Eds.), *Proceedings of the 5th Congress of Science and Football, Lisbon, 11-15th April 2003* (pp. 225-230). Abingdon: Routledge.

Taylor, J.B., Mellalieu, S.D., James, N. & Shearer, D.A. (2008). The influence of match location, quality of opposition, and match status on technical performance in professional association football. *Journal of Sport Sciences,* 26(9), 885-895.

Taylor, J.B., Mellalieu, S.D., & James, N. (2006). The influence of situational variables on soccer performance. In H. Dancs, M.D. Hughes & P. O'Donoghue (Eds.).

Proceedings of the 2006 World Conference of Performance of Sport 7, Szombathely, 23-26 August 2006, pp. 100-109.

Tenga, A., Larsen, O. (2003). Testing the validity of match analysis to describe playing styles in football. *International Journal of Performance Analysis and Sport*, 3(2), 90-102.

Thomas, J.R., & Nelson, J.K. (2001) Research methods in physical activity (4th ed.). Champaign: IL: Human Kinetics.

Tucker, W., Mellalieu, S.D., James, N., & Taylor, J.B. (2005). Game location effects in professional soccer: A case study. *International Journal of Performance Analysis of Sport*, 5, 23-35.

Van Lingen, B. (1997). *Coaching Soccer.* Spring City, PA: Reedswain.

Wallsten, T.S., & Barton, C. (1982). Processing probabilistic multidimensional information for decisions. *Journal of Experimental Pscychology: Learning, Memory and Cognition*, 8, 361-384.

Ward, P., Hodges, N.J., Williams, A.M. & Starkes, J.L. (2004). Deliberate practice and expert performance: Defining the path to excellence. In A.M. Williams, & N.J. Hodges (Eds.), *Skill acquisition in sport: Research, theory and practice, (*pp. 231-258). London: Routledge.

Wein, H. (2004). *Developing game intelligence in soccer*. Spring City, PA: Reedswain.

Wiemeyer, J. (2003).Who should play in which position in soccer? Empirical evidence and unconventional modeling. *International Journal of Performance Analysis in Sport,* 3(1), 1-18.

Williams, A., Williams, M. & Horn, R. (2003). Physical and technical demands of different
playing positions. *Insight,* 6(2), 24-28.

Williams M. & Hodges, N.J. (2005). Practice, instruction and skill acquisition in soccer: Challenging tradition. *Journal of Sport Sciences,* 23(6), 637-650.

Wilson, J. (2008). *Inverting the pyramid: The history of football tactics.* London: Orion.

Winkler, W. (2001). Motor skills and cognitive training for junior soccer players. International *Journal of Performance Analysis in Sport,* 1(1), 91-105.

Yates, I., North, J., Ford, P. & Williams, M. (2006). A quantitative analysis of Italy's World Cup performances. A comparison of World Cup winners. *Insight – The FA Coaches Association Journal, Autumn/Winter, 6,* 55-59.

Yamanaka, K., Hughes, M., & Lott, M. (1993). An analysis of playing patterns in the 1990

World Cup for association football. In T. Reilly, J. Clarys, & A. Stibbe (Ed.), *Science and Football II* (pp. 206-214). London: E & FN Spon.

Yiannakos, A. & Armatas, V. (2006). Evaluation of the goal scoring patterns in European Championship in Portugal 2004. *International Journal of Performance Analysis in Sport.* 6(1), 178-188.

APPENDIX A

Support Material for Ethical Approval

Letter to Football Club

9 March 2008

TO: [redacted] Football Club

FROM: Warren Engelbrecht, Stellenbosch University Sport Performance Institute

REQUEST FOR PERMISSION

In 2008 I had the opportunity to video-tape and then analyse the home matches for the [redacted] Football Club as part of their contract with the Stellenbosch University Sports Performance Institute. I am now requesting permission to re-analyse those matches to address the research questions focused on the outcomes of entries into the penalty area. I have developed for my M. thesis. I have attached a copy of my proposal for your information. You will notice that no demands will be placed on the club in terms of any other logistical requirements since all of the digital recording has already been completed.

POTENTIAL BENEFITS

1. **Information for** [redacted]

   Once the thesis is completed, I will be able to make a full report to [redacted] Football club regarding my findings. This information may be very helpful in providing critical information for future training sessions, especially as it concerns the goal-rates for entries into the penalty area.

2. **Stimulate Future Study in Football**

   The results of such a study could form the building blocks for future studies that would address the nature, and potential problems of goal scoring within South African Football.

3. **Coach and Player Education**

   The results of such a study could play a role in player and coach education and development. If common patterns of play and problems were identified, then it would be possible for players to work on these areas, and for coaches to develop training programmes.

Permission Granted to Perform Study by Football Club

STELLENBOSCH UNIVERSITY
SPORT PERFORMANCE INSTITUTE

Acceptance of Request

Permission granted to re-analyse the matches recorded by the Stellenbosch University Sports Performance Institute as part of their work for the [redacted] Football Club in 2008, for anonymous use only in the M. thesis of Mr. Warren Engelbrecht.

Agreed to: Permission Granted Name & Title: [redacted] Head Coach

Company [redacted] Football Club Date: 12-03-09

Researcher:	Mr Warren P Engelbrecht
Research Project:	Analysis of Entrances into the Penalty Area in Soccer
Nature of the Research Project:	M (Sport Science) degree, Department of Sport Science, SU
Reference number:	166 / 2009
Date:	30 April 2009

The research proposal and associated documentation was tabled and considered by the members of the Ethics Committee (as prescribed by Council on 20 March 2009 and laid down in the SU policy framework) on 30 April 2009; the purpose being to ascertain whether there are any ethical risks associated with the proposed research project of which the researcher has to be aware of or, alternatively, whether the ethical risks are of such a nature that the research cannot continue.

DISCUSSION

The Ethics Committee received the following documentation:

- A completed and signed ethical clearance application form;
- A copy of the research proposal;
- Copy of letter from researcher to [redacted] Football Club, dd 9 March 2009;
- Copies of e-mail correspondence between researcher and [redacted], dd 10-11 March 2009; and
- A copy of the signed Acceptance of Request from [redacted], dd 12 March 2009.

The researcher proposes to investigate the outcomes of penalty area entrances of the [redacted] Football team over the course of ten games played during the 2008 season. These games were recorded by digital video as part of a previous project conducted by the research (a member of the Department of Sport Science) at [redacted]. The researcher will subject the recordings (participant observation) to performance analysis and so determine trends in the play of the ball in the penalty area; how the ball enters the area, what happens to the ball when it enters the penalty area, determine reasons for (un)successful attempts on goal, and the outcomes of entries into the penalty area. The results of the study may benefit future coaching sessions and enrich player performance.

FINDING

This is a complete application in which most of the ethical issues are well-covered; informed consent, the protection of confidentiality and of data. However, this is from the point of view of [redacted] Football Club and not at the level of the individual players. It is the performance of these players that will be analysed, on an individual basis and, while they may benefit from the analysis of their performance, the researcher should

ensure that this analysis will not be to their detriment. In short, the findings of the study could place the contracts of individual [redacted] players at risk. Moreover, while the football club has provided consent, the individual players have not. The researcher must clarify whether this will be an anonymous study from the outset. If individual players become visible, steps must be taken to protect anonymity for there could be risk issues.

RECOMMENDATION

It is recommended, in view of the information at the disposal of the committee, that the proposed research project continues, provided that:

a. The researcher remains within the procedures and protocols indicated in the proposal, particularly in terms of any undertakings made and guarantees given.

b. The researcher notes that his research may have to be submitted again for ethical clearance if there is substantial departure from the existing proposal.

c. The researcher remains within the parameters of any applicable national legislation, institutional guidelines and scientific standards relevant to the specific field of research.

d. The researcher gives attention to the matters raised in the paragraphs above and submits a letter to Ms Maryke Hunter-Husselman, Research Division, Stellenbosch University, clarifying the matter of anonymity for individual players.

Johan Hattingh, Callie Theron, Elmarie Terblanche, Clint le Bruyns, Lourens du Plessis, Ian van der Waag [For the Ethics Committee: 30 April 2009]

Response to Ethical Clearance by Researcher

Attention: Ms. Maryke Hunter-Husselman **15 August 2009**

Letter in response to feedback from Ethical clearance 166/2009

Thank you for the concerns raised in the letter sent to me by the Ethics Committee of Subcommittee A, regarding an issue in my M (Sport Science) study of penalty area entrances of a professional football team in South Africa that requires clarification.

The major concern in the document sent to me is as follows:

The researcher must clarify whether this will be an anonymous study from the outset. If individual players become visible, steps must be taken to protect anonymity for there could be risk issues.

In response to this, I can assure you that it is an anonymous study from the point of view of the team as well as the individual players for the following reasons:

1. There is no mention or reference to the name or geographical location of the team in the study.

2. There is no mention of any players' names or reference to them in the study, as the focus is on the analysis of the performance of the team as a whole, and no individual player analysis took place.

3. During the course of the 10 games played, the players on the field changed, i.e. the same players did not play all 10 games. This emphasizes that the analysis was of team play rather than individual play.

4. No video footage will be accessible to anyone other than the researcher, and no images will be presented in the M study. Also, the video footage is from an elevated camera angle, which does not allow for easy identification of players.

5. There have been no changes in my protocols since first application.

I trust that you view my steps to ensure anonymity in a positive light.

Kind Regards

Warren Engelbrecht
M Student, Department of Sport Science
14138662

APPENDIX B

Data Tables for 10 Matches

General Overview of Attacking Play														
Match	Total Penalty Area Entrances	For	Against	Points	Total Shots	Box Entries/ Shots	Box Entries/ Goals	Shots/ Goals	Shot off Target	Shot on Target	Blocked Shots	Shots from outside penalty area	Shots from inside penalty area
1	52	3	0	3	14	3.7	17.3	4.7	6	8	0	2	12
2	58	3	1	3	13	4.5	19.3	4.3	9	4	0	5	8
3	54	1	0	3	12	4.5	54.0	12.0	4	7	1	1	11
4	56	1	1	1	9	6.2	56.0	9.0	5	4	0	2	7
5	81	0	0	1	12	6.8	-	-	10	2	0	6	6
6	53	2	0	3	18	2.9	26.5	9.0	9	7	2	5	13
7	43	4	0	3	8	5.4	10.8	2.0	3	5	0	0	8
8	66	3	0	3	21	3.1	22.0	7.0	9	10	2	3	18
9	64	1	1	1	19	3.4	64.0	19.0	6	10	3	6	13
10	67	1	2	0	17	3.9	67.0	17.0	9	5	3	3	14
Total	**594.0**	**19.0**	**5.0**	**21.0**	**143.0**	-	-	-	**70.0**	**62.0**	**11.0**	**33.0**	**110.0**
Mean	**59.4**	**1.9**	**0.5**	**2.1**	**14.3**	**4.4**	**37.4**	**9.3**	**7.0**	**6.2**	**1.1**	**3.3**	**11.0**
Std. Dev.	**10.5**	**1.3**	**0.7**	**1.2**	**4.3**	**1.3**	**22.4**	**5.8**	**2.5**	**2.7**	**1.3**	**2.1**	**3.7**
Median	**57.0**	**1.5**	**0.0**	**3.0**	**13.5**	**4.2**	**26.5**	**9.0**	**7.5**	**6.0**	**0.5**	**3.0**	**11.5**

Point of Origin of Final Action																		
Match	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**Other**
1	15	9	4	12	6	0	2	1	0	2	1	0	0	0	0	0	0	0
2	13	7	2	17	12	1	2	1	0	1	0	0	0	2	0	0	0	0
3	11	11	8	10	3	0	5	1	1	1	2	0	1	0	0	0	0	0
4	13	3	10	15	5	2	3	3	1	1	0	0	0	0	0	0	0	0
5	19	12	13	20	7	2	4	2	0	0	1	0	1	0	0	0	0	0
6	9	5	5	19	5	3	1	1	1	4	0	0	0	0	0	0	0	0
7	7	12	4	10	3	3	2	0	1	0	0	1	0	0	0	0	0	0
8	15	10	7	17	8	3	3	0	1	2	0	0	0	0	0	0	0	0
9	12	14	9	14	4	1	3	1	0	2	2	0	1	0	0	0	1	0
10	6	16	2	18	13	4	2	4	1	1	0	0	0	0	0	0	0	0
Total	**120.0**	**99.0**	**64.0**	**152.0**	**66.0**	**19.0**	**27.0**	**14.0**	**6.0**	**14.0**	**6.0**	**1.0**	**3.0**	**2.0**	**0.0**	**0.0**	**1.0**	**0.0**
Mean	**12.0**	**9.9**	**6.4**	**15.2**	**6.6**	**1.9**	**2.7**	**1.4**	**0.6**	**1.4**	**0.6**	**0.1**	**0.3**	**0.2**	**0.0**	**0.0**	**0.1**	**0**
Std. Dev.	**12.5**	**10.5**	**6.0**	**16.0**	**5.5**	**2.0**	**2.5**	**1.0**	**1.0**	**1.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0**
Median	**3.9**	**4.0**	**3.6**	**3.6**	**3.5**	**1.4**	**1.2**	**1.3**	**0.5**	**1.2**	**0.8**	**0.3**	**0.5**	**0.6**	**0.0**	**0.0**	**0.3**	**0**
%	**20.2**	**16.7**	**10.8**	**25.6**	**11.1**	**3.2**	**4.5**	**2.4**	**1.0**	**2.4**	**1.0**	**0.2**	**0.5**	**0.3**	**0.0**	**0.0**	**0.2**	**0.0**

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Area of Entrance					
Match	**Right Side**	**Left Side**	**Right Front**	**Left Front**	**Other**
1	11	19	15	7	0
2	9	13	21	15	0
3	12	14	12	16	0
4	4	19	11	22	0
5	15	25	21	20	0
6	7	11	18	17	0
7	12	9	9	13	0
8	17	16	14	19	0
9	14	16	19	15	0
10	21	6	23	17	0
Total	**122.0**	**148.0**	**163.0**	**161.0**	**0.0**
Mean	**12.2**	**14.8**	**16.3**	**16.1**	**0.0**
Std. Dev.	**12.0**	**15.0**	**16.5**	**16.5**	**0.0**
Median	**4.9**	**5.5**	**4.8**	**4.1**	**0.0**
%	**20.5%**	**24.9%**	**27.4%**	**27.1%**	**0.0%**

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Area of Entrance					
Match	**Right Side**	**Left Side**	**Right Front**	**Left Front**	**Other**
1	11	19	15	7	0
2	9	13	21	15	0
3	12	14	12	16	0
4	4	19	11	22	0
5	15	25	21	20	0
6	7	11	18	17	0
7	12	9	9	13	0
8	17	16	14	19	0
9	14	16	19	15	0
10	21	6	23	17	0
Total	**122.0**	**148.0**	**163.0**	**161.0**	**0.0**
Mean	**12.2**	**14.8**	**16.3**	**16.1**	**0.0**
Std. Dev.	**12.0**	**15.0**	**16.5**	**16.5**	**0.0**
Median	**4.9**	**5.5**	**4.8**	**4.1**	**0.0**
%	**20.5%**	**24.9%**	**27.4%**	**27.1%**	**0.0%**

Number of Completed Passes within Penalty Area				
Match	**None**	**One**	**Two**	**Three or more**
1	47	4	1	0
2	55	3	0	0
3	52	2	0	0
4	53	3	0	0
5	80	1	0	0
6	51	2	0	0
7	40	3	0	0
8	65	1	0	0
9	64	0	0	0
10	65	2	0	0
Total	**572.0**	**21.0**	**1.0**	**0.0**
Mean	**57.2**	**2.1**	**0.1**	**0.0**
Std. Dev.	**54.0**	**2.0**	**0.0**	**0.0**
Median	**11.4**	**1.2**	**0.3**	**0.0**
%	**96.3%**	**3.5%**	**0.2%**	**0.0%**

Method of Entrance												
Match	Cross	Long Pass	Short Pass	Comb. Play	Individual Action	Free Kick	Corner	Throw In	Goal Kick	Penalty	Direct Shot-Open Play	Other
1	9	5	12	0	8	3	8	5	0	0	2	0
2	10	6	17	1	6	6	3	4	0	0	5	0
3	12	8	10	1	2	10	7	3	0	0	1	0
4	9	5	14	1	7	6	4	6	0	0	2	2
5	10	10	20	0	5	10	7	12	0	0	6	1
6	0	5	12	0	4	11	3	13	0	0	5	0
7	9	7	12	1	4	4	3	3	0	0	0	0
8	6	6	18	1	7	10	9	5	0	0	3	1
9	11	11	11	0	3	4	10	7	0	0	6	1
10	3	10	17	0	5	11	12	6	0	0	3	0
Total	**79.0**	**73.0**	**143.0**	**5.0**	**51.0**	**75.0**	**66.0**	**64.0**	**0.0**	**0.0**	**33.0**	**5.0**
Mean	**7.9**	**7.3**	**14.3**	**0.5**	**5.1**	**7.5**	**6.6**	**6.4**	**0.0**	**0.0**	**3.3**	**0.5**
Std. Dev.	**9.0**	**6.5**	**13.0**	**0.5**	**5.0**	**8.0**	**7.0**	**5.5**	**0.0**	**0.0**	**3.0**	**0.0**
Median	**3.8**	**2.3**	**3.4**	**0.5**	**1.9**	**3.2**	**3.2**	**3.5**	**0.0**	**0.0**	**2.1**	**0.7**
%	**13.3%**	**12.3%**	**24.1%**	**0.8%**	**8.6%**	**12.6%**	**11.1%**	**10.8%**	**0.0%**	**0.0%**	**5.6%**	**0.8%**

Outcome									
Match	**Goals**	**No Goal**	**Give Away**	**Take Away**	**Foul For**	**Foul Against**	**Poss. Maintained**	**Other**
1	3	11	7	25	0	1	3	2
2	3	10	14	21	0	4	5	1
3	1	11	14	19	0	4	5	0
4	1	8	18	24	0	0	5	0
5	0	12	17	42	0	1	9	0
6	2	16	8	21	0	5	1	0
7	4	4	11	16	0	5	3	0
8	3	19	17	24	0	3	0	0
9	1	18	15	28	0	1	1	0
10	1	16	12	31	0	3	4	0
Total	**19.0**	**125.0**	**133.0**	**251.0**	**0.0**	**27.0**	**36.0**	**3.0**
Mean	**1.9**	**12.5**	**13.3**	**25.1**	**0.0**	**2.7**	**3.6**	**0.3**
Std. Dev.	**1.5**	**11.5**	**14.0**	**24.0**	**0.0**	**3.0**	**3.5**	**0.0**
Median	**1.3**	**4.7**	**3.8**	**7.3**	**0.0**	**1.8**	**2.6**	**0.7**
%	**3.2%**	**21.0%**	**22.4%**	**42.3%**	**0.0%**	**4.5%**	**6.1%**	**0.5%**

Reason for Outcome													
Match	**Tackle**	**Inter-ception**	**Poor Pass**	**Poor Control**	**GK Save**	**GK Inter-ception**	**Shot off Target**	**Shot on Target**	**Block Shot**	**Weak Defence**	**Foul**	**Completed Pass**	**Other**
1	8	14	5	2	5	3	6	2	0	1	1	3	2
2	9	7	13	1	1	5	9	2	0	1	3	5	2
3	5	9	14	0	6	5	4	1	1	0	4	5	0
4	7	9	14	3	3	8	5	0	0	1	0	5	1
5	10	23	16	1	2	8	10	0	0	0	1	9	1
6	4	13	6	2	5	4	9	2	2	0	5	1	0
7	4	6	10	1	1	6	3	1	0	3	5	3	0
8	5	15	15	2	7	5	9	2	2	1	3	0	0
9	4	14	14	1	9	9	6	0	3	1	1	1	1
10	7	14	12	0	4	10	9	1	3	0	3	4	0
Total	**63.0**	**124.0**	**119.0**	**13.0**	**43.0**	**63.0**	**70.0**	**11.0**	**11.0**	**8.0**	**26.0**	**36.0**	**7.0**
Mean	**6.3**	**12.4**	**11.9**	**1.3**	**4.3**	**6.3**	**7.0**	**1.1**	**1.1**	**0.8**	**2.6**	**3.6**	**0.7**
Std. Dev.	**6.0**	**13.5**	**13.5**	**1.0**	**4.5**	**5.5**	**7.5**	**1.0**	**0.5**	**1.0**	**3.0**	**3.5**	**0.5**
Median	**2.2**	**4.9**	**3.8**	**0.9**	**2.6**	**2.3**	**2.5**	**0.9**	**1.3**	**0.9**	**1.8**	**2.6**	**0.8**
%	**10.6%**	**20.9%**	**20.0%**	**2.2%**	**7.2%**	**10.6%**	**11.8%**	**1.9%**	**1.9%**	**1.3%**	**4.4%**	**6.1%**	**1.2%**

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APPENDIX C

Dat

Point of Origin of Final Action	Area of Entrance: Match	Right Side	Left Side	Right Front	Left Front	Other				
Other	1		1	1					0	0.0
17	2	1		1					0	0.0
16	3	1							0	0.0
15	4	1							0	0.0
14	6		1		1				0	0.0
13	7			1	1				0	0.0
12		1			1				0	0.0
11	8	1		1					0	0.0
10	9	1		1			1		1	5.3
	10	1							0	0.0
	Sum	8	2	6	3	0				
	%	42.1%	10.5%	31.6%	15.8%	0.0%				

Point of Origin of Final Action	Match	1	2	3	4	6	7	8	9	10	Sum	%
9						1					1	5.3
8											0	0.0
7								1			1	5.3
6											0	0.0
5		1	1					1			3	15.8
4	1						1 1 1				4	21.1
3											0	0.0
2	1	1		1	1			1		1	7	36.8
1	1					1					2	10.5

a Tables for Goals Scored

Number of Completed Passes within Penalty Area				
Match	**None**	**One**	**Two**	**Three or more**
1	1			
			1	
	1			
2		1		
	1			
	1			
3	1			
4	1			
6	1			
	1			
7		1		
	1			
	1			
	1			
8	1			
	1			
	1			
9	1			
10	1			
Sum	**16**	**2**	**1**	**0**
%	**84.2%**	**10.5%**	**5.3%**	**0.0%**

Method of Entrance												
Match	**Cross**	**Long Pass**	**Short Pass**	**Comb. Play**	**Individual Action**	**Free Kick**	**Corner**	**Throw In**	**Goal Kick**	**Penalty**	**Direct Shot-Open Play**	**Other**
1							1					
					1							
	1											
2								1				
						1						
					1							
3							1					
4	1											
6							1					
		1										
7			1									
			1									
			1									
	1											
8						1						
			1									
							1					
9		1										
10							1					
Sum	**3**	**2**	**4**	**0**	**2**	**2**	**5**	**1**	**0**	**0**	**0**	**0**
%	**15.8%**	**10.5%**	**21.1%**	**0.0%**	**10.5%**	**10.5%**	**26.3%**	**5.3%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

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Reason For Goal Being Scored		
Match	**Shot on Target**	**Weak Defence**
1	1	
	1	
		1
2	1	
	1	
		1
3	1	
4		1
6	1	
	1	
7		1
	1	
		1
		1
8	1	
		1
	1	
9		1
10	1	
Sum	**11**	**8**
%	**57.9%**	**42.1%**

APPENDIX D
Data From a Single Match

Point of Origin of Final Action																					
Entry	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Other
1		1																		
2				1																
3		1																		
4		1				1														
5				1																
6		1																		
7					1															
8		1																		
9																				
10		1																		
11		1											1							
12		1																		
13														1						
14			1																	
15			1																	
16		1																		
17				1																
18			1																	
19					1															

Entry	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Other
20			1															
21		1																
22				1														
23					1													
24				1														
25	1																	
26								1										
27						1												
28				1														
29				1														
30		1																
31													1					
32				1														
33				1														
34			1															
35	1																	
36				1														
37		1																
38								1										
39							1											

Entry	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Other
40				1														
41			1															
42	1																	
43	1																	
44	1																	
45				1														
46			1															
47		1																
48				1														
49			1															
50	1																	
51	1																	
52	1																	
53	1																	
54		1																
55	1																	
56				1														
57					1													

17	Other
0	**0**
0.0	**0.0**

Entry	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Other
58				1														
59			1															
60			1															
61				1														
62					1													
63	1																	
64				1														
65							1											
66	1																	
67				1														
68		1																
69						1												
70	1																	
71			1															
72	1																	
73							1											

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Entry	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
74					1													
75				1														
76		1																
77				1														
78					1													
79					1													
80			1															
81	0		1															
Total	19	12	13	20	7	2	4	2	0	0	1	0	1	0	0	0		
%	20.9	13.2	14.3	22.0	7.7	2.2	4.4	2.2	0.0	0.0	1.1	0.0	1.1	0.0	0.0	0.0		

Area of Entrance	Other																							

Entry	**Right Side**	**Left Side**	**Right Front**	**Left Front**
1	1			
2			1	
3	1			
4	1			
5				1
6		1		
7			1	
8		1		
9	1			
10		1		
11		1		
12		1		
13			1	
14		1		
15				1
16	1			
17			1	
18				1

138

Entry	Right Side	Left Side	Right Front	Left Front	Other
31			1		
32				1	
33				1	
34		1			
35		1			
36				1	
37	1				
38			1		
39			1		
40			1		
41		1			
42		1			
43		1			
44		1			
45			1		
46				1	
47	1				
48			1		
49		1			
50		1			
51		1			
52		1			
53		1			
54		1			
55		1			
56				1	
57			1		
58				1	
59				1	
60		1			
61				1	
62	1				

139

Entry	Right Side	Left Side	Right Front	Left Front	Other
63		1			
64			1		
65			1		
66		1			
67			1		
68	1				
69				1	
70		1			
71				1	
72		1			
73			1		
74	1				
75			1		
76	1				
77			1		
78	1				
79			1		
80				1	
81				1	
Total	15	25	21	20	0
%	18.5%	30.9%	25.9%	24.7%	0.0%

Other

Method of Entrance												
Entry	Cross	Long Pass	Short Pass	Comb. Play	Individual Action	Free Kick	Corner	Throw In	Goal Kick	Penalty	Direct Shot-Open Play	Other
1							1					
2					1							
3								1				
4						1						
5					1							
6	1											
7						1						
8							1					
9							1					
10	1											
11					1							
12								1				
13		1										
14			1									
15						1						
16					1							
17			1									
18			1									
19		1										
20						1						
21							1					
22											1	
23								1				
24												1
25	1											
26		1										
27						1						
28											1	

141

Direct Shot-Open Play	Other
1	
6	1
7.4%	1.2%

Entry	Cross	Long Pass	Short Pass	Comb. Play	Individual Action	Free Kick	Corner	Throw In	Goal Kick	Penalty	Direct Shot-Open Play
29											1
30							1				
31		1									
32		1									
33			1								
34								1			
35	1										
36											1
37						1					
38		1									
39		1									
40					1						
41			1								
42	1										
43								1			
44	1										
45			1								
46			1								
47	1										
48											1
49			1								
50			1								
51								1			
52	1										
53							1				
54								1			
55								1			
56			1								
57						1					
58			1								
59			1								

142

Passes within Penalty
Three or more

Entry	None	One	Two
1	1		
2	1		
3	1		
4	1		
5	1		
6	1		
7	1		
8	1		
9	1		
10	1		
11		1	
12	1		
13	1		
14	1		
15	1		
16	1		
17	1		
18	1		
19	1		
20	1		
21	1		
22	1		
23	1		
24	1		
25	1		
26	1		
27	1		
28	1		
29	1		

Entry	None	One	Two	Three or more
30	1			
31	1			
32	1			
33	1			
34	1			
35	1			
36	1			
37	1			
38	1			
39	1			
40	1			
41	1			
42	1			
43	1			
44	1			
45	1			
46	1			
47	1			
48	1			
49	1			
50	1			
51	1			
52	1			
53	1			
54	1			
55	1			
56	1			
57	1			
58	1			
59	1			
60	1			

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Entry	None	One	Two	Three or more
61	1			
62	1			
63	1			
64	1			
65	1			
66	1			
67	1			
68	1			
69	1			
70	1			
71	1			
72	1			
73	1			
74	1			
75	1			
76	1			
77	1			
78	1			
79	1			
80	1			
81	1			
Total	80	1	0	0
%	98.8%	1.2%	0.0%	0.0%

Outcome								
Entry	**Goals**	**No Goal**	**Give Away**	**Take Away**	**Foul For**	**Foul Against**	**Poss. Maintained**	**Other**
1		1						
2				1				
3			1					
4				1				
5							1	
6			1					
7				1				
8				1				
9				1				
10			1					
11				1				
12		1						
13			1					
14							1	
15		1						
16				1				
17			1					
18				1				
19			1					
20		1						
21				1				
22		1						
23				1				
24				1				
25				1				
26				1				
27				1				
28		1						
29		1						

147

Entry	Goals	No Goal	Give Away	Take Away	Foul For	Foul Against	Poss. Maintained	Other
30		1						
31				1				
32				1				
33			1					
34						1		
35				1				
36		1						
37		1						
38			1					
39				1				
40				1				
41			1					
42				1				
43							1	
44							1	
45			1					
46				1				
47				1				
48		1						
49				1				
50			1					
51				1				
52				1				
53			1					
54				1				
55				1				
56							1	
57			1					
58				1				
59				1				
60							1	

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n for Outco
Other
1

Entry	Goals	No Goal	Give Away	Take Away	Foul For	Foul Against	Poss. Maintained	Other
61		1						
62				1				
63			1					
64				1				
65				1				
66				1				
67							1	
68			1					
69							1	
70				1				
71				1				
72			1					
73				1				
74				1				
75							1	
76			1					
77				1				
78				1				
79				1				
80				1				
81	0	0		1				
Total	**0**	**12**	**17**	**42**	**0**	**1**	**9**	**0**
%	**0.0%**	**14.8%**	**21.0%**	**51.9%**	**0.0%**	**1.2%**	**11.1%**	**0.0%**

149

Other

Entry	Tackle	Interception	Poor Pass	Poor Control	GK Save	GK Interception	Shot off Target	Shot on Target	Block Shot	Weak Defence	Foul	Completed Pass
1							1					
2		1										
3			1									
4		1										
5												1
6			1									
7		1										
8		1										
9												
10			1									
11	1											
12							1					
13			1									
14												1
15							1					
16		1										
17			1									
18	1											
19			1									
20					1							
21	1											
22					1							
23		1										
24		1										
25		1										
26						1						

150

Completed Pass	Other
1	
1	
1	
1	
1	
9	1
11.1%	1.2%

Entry	Tackle	Interception	Poor Pass	Poor Control	GK Save	GK Interception	Shot off Target	Shot on Target	Block Shot	Weak Defence	Foul	Completed Pass
27		1										
28							1					
29							1					
30							1					
31						1						
32		1										
33			1									
34											1	
35						1						
36							1					
37							1					
38			1									
39		1										
40		1										
41			1									
42		1										
43												1
44												1
45				1								
46	1											
47						1						
48							1					
49		1										
50			1									
51						1						
52		1										
53			1									
54	1											
55						1						

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Entry	Tackle	Interception	Poor Pass	Poor Control	GK Save	GK Interception	Shot off Target	Shot on Target	Block Shot	Weak Defence	Foul
56											
57			1								
58	1										
59		1									
60											
61							1				
62		1									
63			1								
64		1									
65		1									
66		1									
67											
68			1								
69											
70						1					
71	1										
72			1								
73		1									
74	1										
75											
76			1								
77		1									
78	1										
79	1										
80		1									
81						1					
Total	10	23	16	1	2	8	10	0	0	0	1
%	12.3%	28.4%	19.8%	1.2%	2.5%	9.9%	12.3%	0.0%	0.0%	0.0%	1.2%

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